fx-CG50 Training Material

Our Philosophy

Innovative products bring joy, create new lifestyle and pave the way for related economies - especially, if they have been developed by CASIO. Experience how creativity becomes contribution.

Creativity

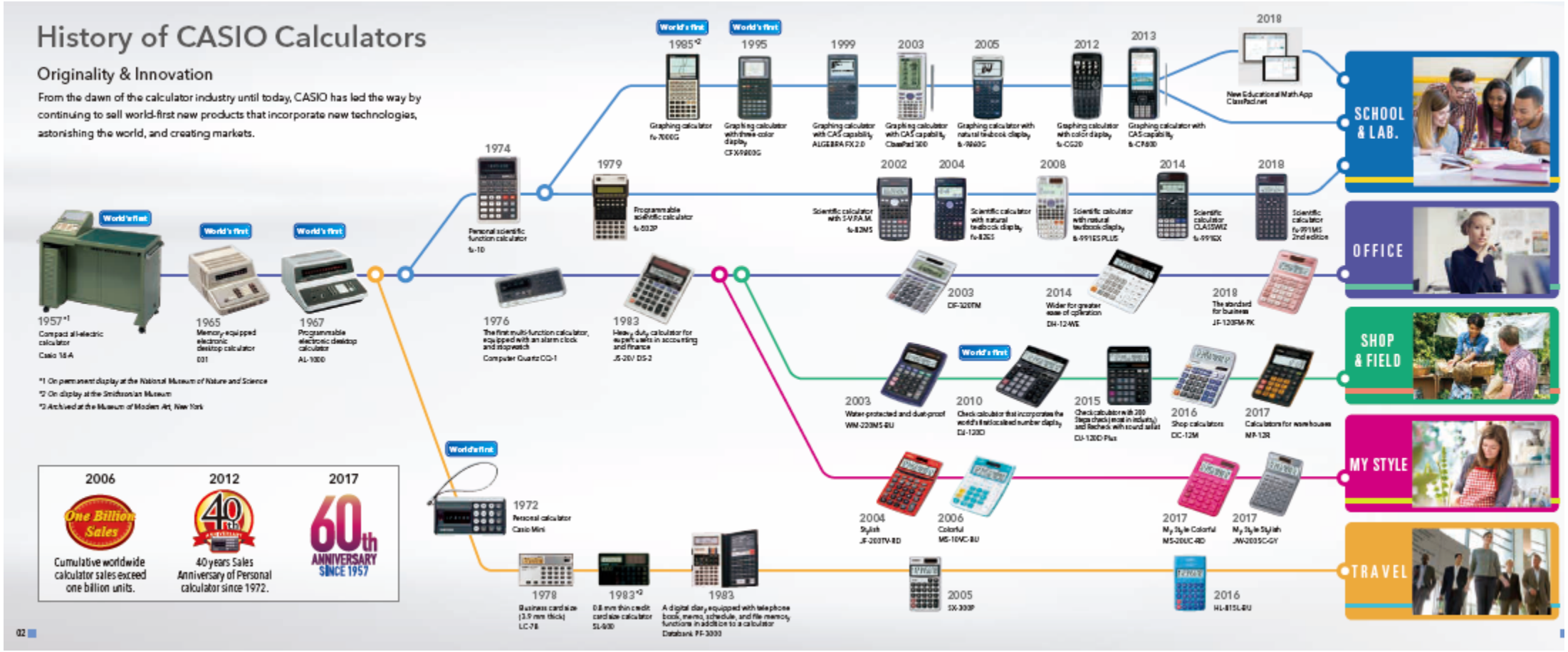
To create necessary Educational Tools based on educational requirement for better Teaching/Learning.

Contribution

To contribute to realize better Education by supporting Classroom.

Casio Computer Company was founded in Tokyo in 1946 by the Kashio family. Four Kashio brothers--Toshio, Kazuo, Tadao, and Yukio--and in 1957 introduced the world's first entirely electric compact calculator.

https://world.casio.com/corporate/history/



Casio Ed.Dep

Training

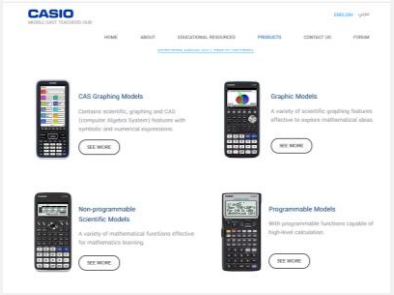
Construction of a training system that allows all teachers to train using a scientific calculator.

Education Material

Support with Math activities and Paper material for teachers And students

Emulators

Educational software's Support interactive Learning and Educational technology

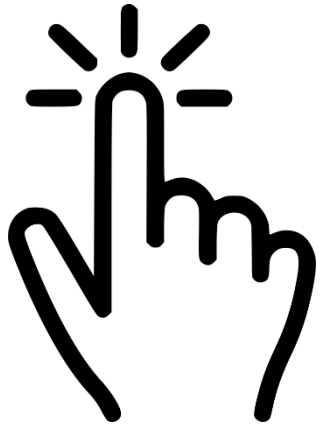


Teachers Forum

Microsite is a webpage that connect teachers together With material resources and E-activities

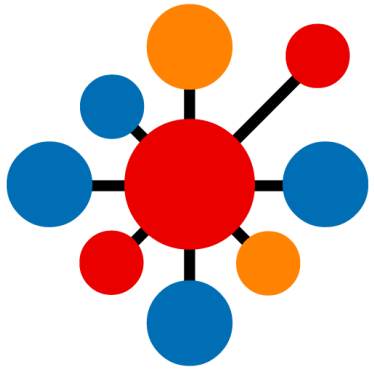
WHY?

CASIO

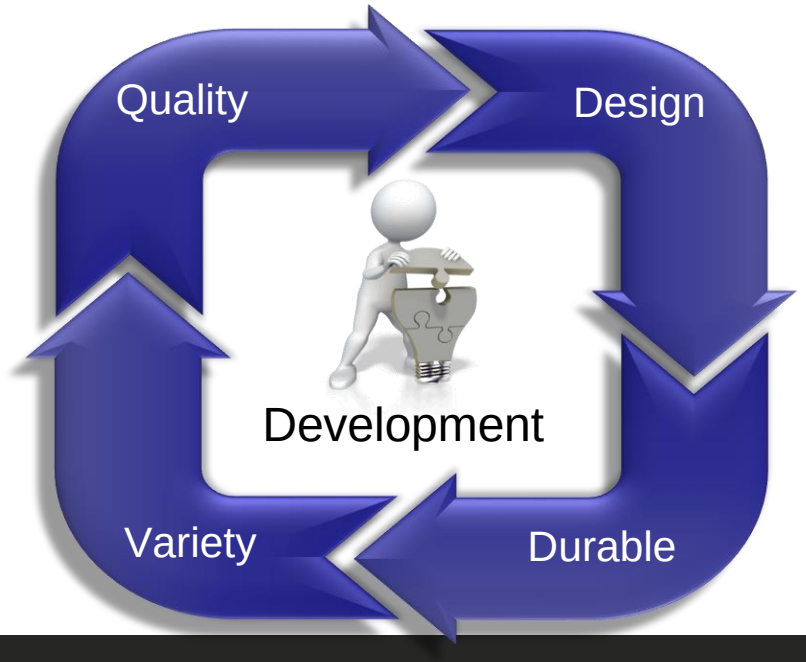


Reliable

Durable



Variety



CG50 Specs

01

- Screen size: 384 x 216 pixels, Spacious 3.17” LCD screen.
- Over 82,000 pixels, over 65,000 colors.
- Size (H x W x D mm): 20,6 x 89,5 x 188,5 , Weight: 230 g
- 16 MB FLASH ROM memory for data archive and storage of Apps.

02

- Change style and color of axes and grids on graphs.
- Zoom in\out
- 28 Variables
- Solve up to 6 unknown \ degree 6

03

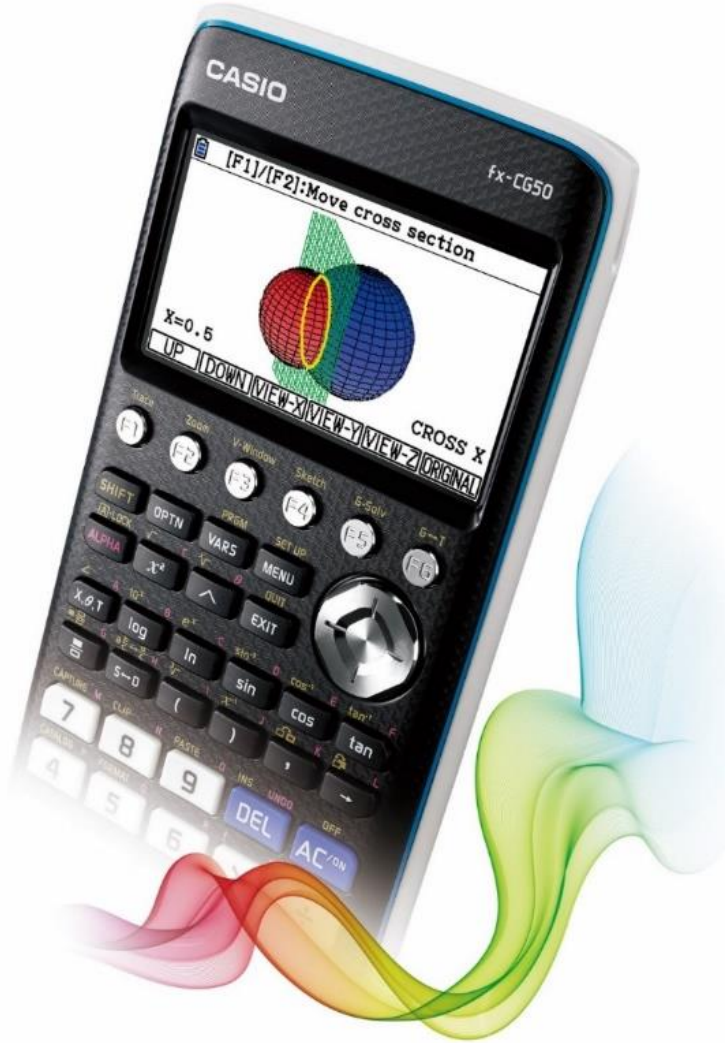
- +3000 Functions.
- 10 hypothesis testing functions,
- 7 confidence interval functions,
- 15 probability distribution functions

04

- Up to 20 graphing functions defined, saved, graphed and analyzed at one time.
- Sketch Inverse , Tangent, Normal
- Exam mode.
- 3D-Graph

05

- Periodic Table
- E-CON 4 Data Collector
- Direct-connect to compatible projectors & USB-to-computer connectivity.



School & Lab

Fx-9860GII

fx-CG50

APPROVED

CASIO Graphic Calculators for:

- AP Examination
- SAT Examination
- SAT Subject Examination
- PSAT Examination
- NMSQT Examination
- ACT Examination
- IB Examination

Icon Menu Description

Ordinary Calculations,

Trigonometry ,Vectors, Matrices,

Unit Conversion ,Complex Calculations, Numerical, Prob, Calculus , Binary , decimal ,and hexadecimal functions.

Statistics Basic/Advanced

Tests/Distributions/Graph

Single-variable (standard deviation) and paired variable (regression) statistical calculations, to perform tests, to analyze data and to draw statistical graphs

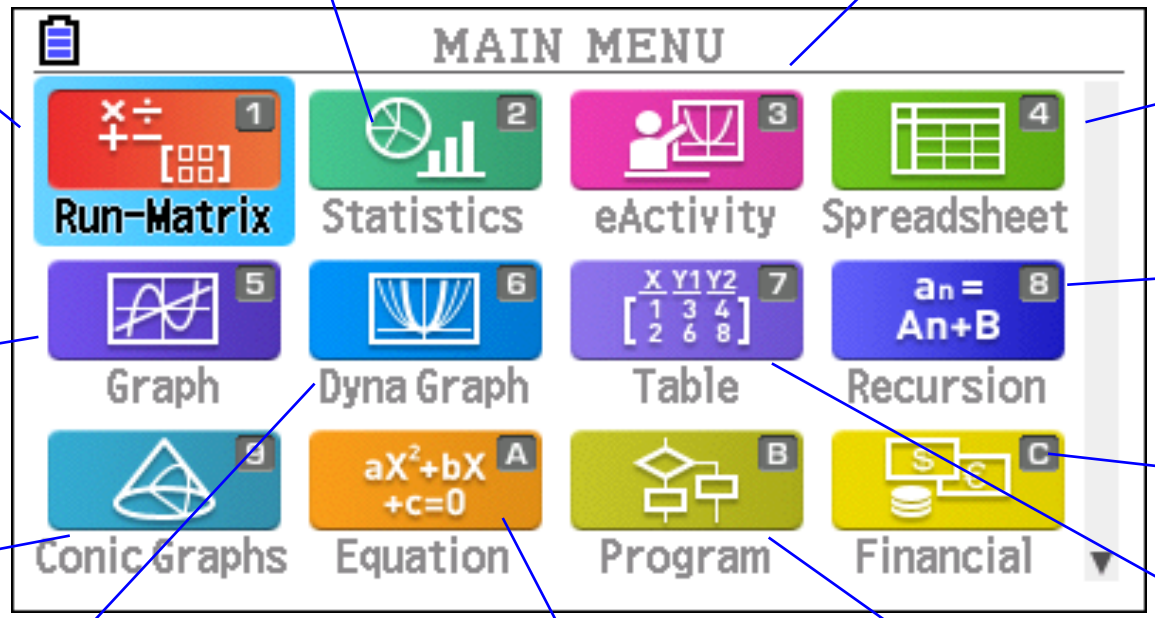
Electronic Presentations/Data

Calculator Applications

Excel Sheet

Data Entry/ formulas/ Graphs.

you can similarly enter math formulas such as *Sum*, *Mean*, integration , complex calculation .. etc



All types of Graphs and Operations on Graph (roots , intersections , slope …):

Rectangular: Y = , Y <, Y > , X <, X >

Polar: r =

Parametric.

Sequences, Recursive form, terms, graph

Financial Calculations and to draw cash flow and other types of graphs.

: Interest, Bonds, Margin, Cost, Cash…

Conic Graph: Parabola, Ellipse, Hyperbola , circle & properties

Table of Values of x, f(x) & generate a numeric table of different solutions and Graph

Graph Transformations

Solving Equations: to solve linear equations with 2 through 6 unknowns, and high-order equations from 2nd to 6th degree

Systems / Polynomials, Other (Exp, Ln, Log, Trig)

Basic Language Programs.

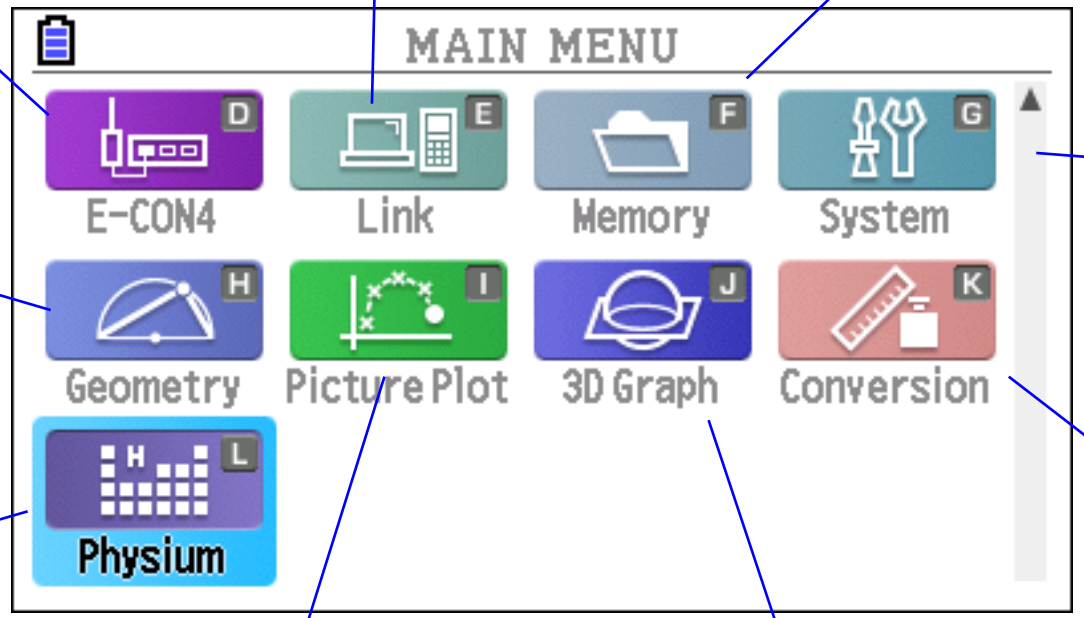
Icon Menu Description

Scientific Sensors: Temp, Sound, motion

Link to: PC, Projector, Calculator, OHP

And transfer memory contents or back-up data

Memory Settings: Main, storage, SD, Backup. Optimization



Geometry: Draw figures, Construct Special lines, Transformations, measurements

System Settings: Contrast, Version, Language, Reset, Power.

Physium: Scientific Constants / Periodic Table

This icon menu allows you to plot points (that represent coordinates) on the screen and then perform various analysis based on the plotted data.

3D Graph:

Draw any 3D graph, rotate it and find intersections with x,y or z axis

Conversion:

Unit conversion

Objectives :

Participants at the end of the workshop will be able to:

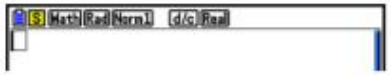
- Simplify expression.
- Solve Matrices.
- Solve Vectors.
- Solve Complex Numbers.
- Solve Calculus (derivatives and integrations).
- Solve different types of equations.
- Solve system of equations and polynomials.
- Conic Graphs
- Solving Graphs
- Recursion
- Table
- Statistics
- Solving Math Problems

Fx-CG-50 Overview

1. Switch on calculator [AC/ON]
2. Turn off Calculator [SHIFT] [AC/ON]
3. To activate yellow functions, click [SHIFT] then desired key.
4. To activate red functions, click [ALPHA] then desired key.
5. The function keys [F1] [F2] [F3] [F4] [F5] [F6] Allow you to access the tab (soft key) menus That appear at the bottom of the screen.
6. The [MENU] key displays every mode the calculator has.
7. The [EXIT] key operates like the back arrow on a web browser; it will take you back one screen each time you select it.
8. The [EXE] key executes operations.
9. The [OPTN] for more tab menus (options).
10. The [VARS] for more tab menus (options).

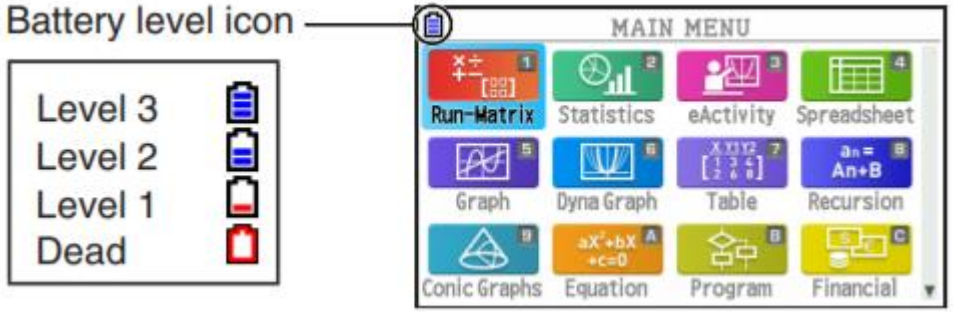
■ Status Bar

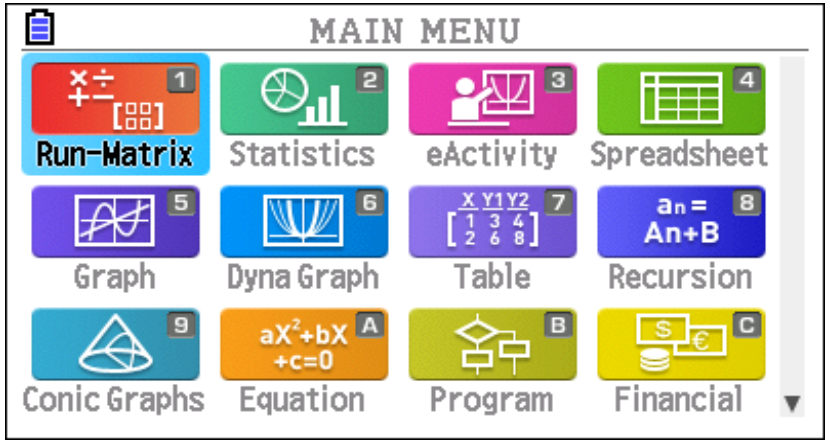
The status bar is an area that displays messages and the current status of the calculator. It is always displayed at the top of the screen.

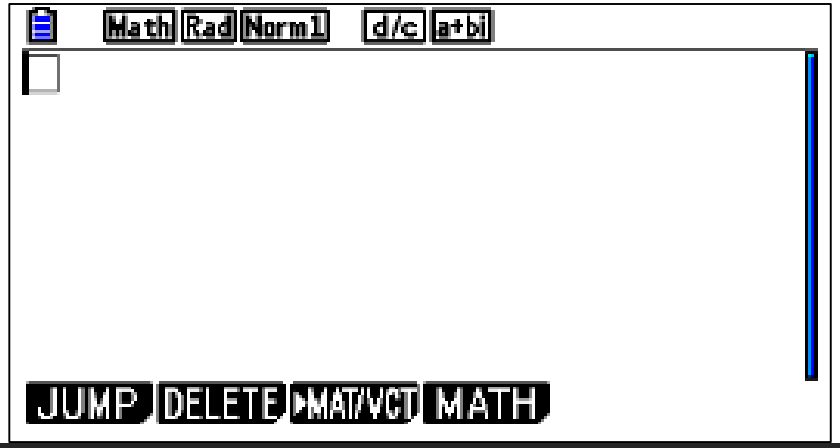


• Icons are used to indicate the information described below.

This icon:	Indicates this:
	The current battery level. The icons indicated (from left to right): Level 3, Level 2, Level 1, Dead. See "Low Battery Message" (page 1-40) for more information. ***Important!*** If the Level 1 icon () appears, immediately replace the batteries. For details about battery replacement, see the separate "Hardware User's Guide".
	Calculation in progress.
S	SHIFT key was pressed and the calculator is standing by for the next key operation.
A a	ALPHA key was pressed and the calculator is standing by for the next key operation. The a icon indicates the lower-case input mode (**eActivity** and **Program** modes only).
A a	Alpha Lock (page 1-2) is in effect.
	SHIFT 8 (CLIP) was pressed and the calculator is standing by for range specification (page 1-11).
Math Line	Setup "Input/Output" setting.
Rad Deg Gra	Setup "Angle" setting.
Fix2 Sci3 Norm1 Norm1/E	Setup "Display" setting.
d/c ab/c	Setup "Frac Result" setting.
Real a+bi r∠θ	Setup "Complex Mode" setting.







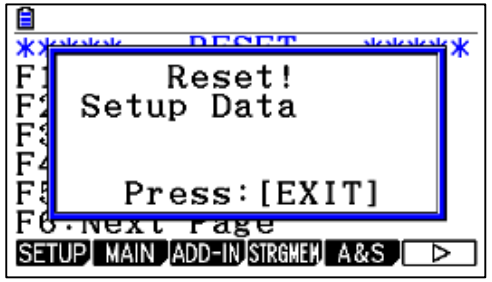
Function Symbol

Function/Symbol	Key Operation
Fraction (Improper)	$\square\!\!\square$
Mixed Fraction*1	SHIFT $\square\!\!\square$ (▬)
Power	$\wedge$
Square	x^2
Negative Power (Reciprocal)	SHIFT) (x^{-1})
$\sqrt{\ }$	SHIFT x^2 ($\sqrt{\ }$)
Cube Root	SHIFT (($\sqrt[3]{\ }$)
Power Root	SHIFT $\wedge$ ($\sqrt[x]{\ }$)
e^x	SHIFT ln (e^x)
10^x	SHIFT log (10^x)
log(a,b)	(Input from MATH menu*2)
Abs (Absolute Value)	(Input from MATH menu*2)
First Derivative	(Input from MATH menu*2)
Second Derivative	(Input from MATH menu*2)
Integral*3	(Input from MATH menu*2)
Σ Calculation*4	(Input from MATH menu*2)
Matrix, Vector	(Input from MATH menu*2)
Parentheses	(and)
Braces (Used during list input.)	SHIFT × ({) and SHIFT ÷ (})
Brackets (Used during matrix/vector input.)	SHIFT + ([ ) and SHIFT − ( ])

From the main menu move to reach system

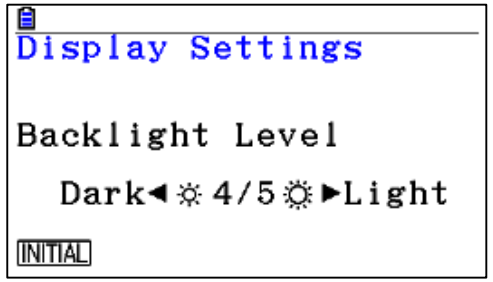
1. Reset data:

MENU EXE F5 F1 F1 EXIT



2. Display setting:

F1 ▶ ▶ ◀ EXIT



■ Getting the Calculator Back to its Original Mode Settings

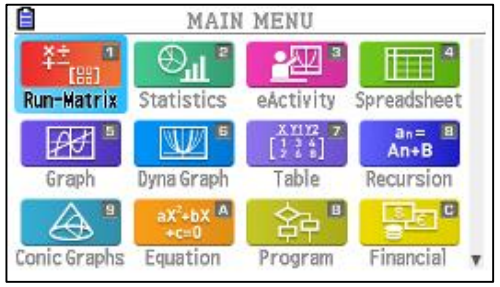
1. From the Main Menu, enter the **System** mode.
2. Press F5 (RESET).
3. Press F1 (SETUP), and then press F1 (Yes).
4. Press EXIT MENU to return to the Main Menu.

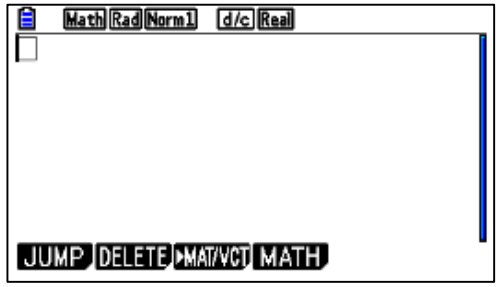
Now enter the correct mode and perform your calculation again, monitoring the results on the display.

Run-Matrix Mode

Matrices operations, Ordinary Calculations, Trigonometry ,Vectors, Unit Conversion ,Complex Calculations, Calculus , Binary , decimal ,and hexadecimal functions.

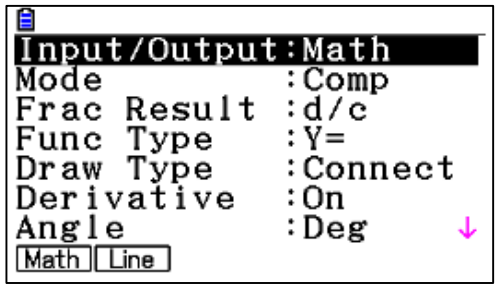
MENU 1

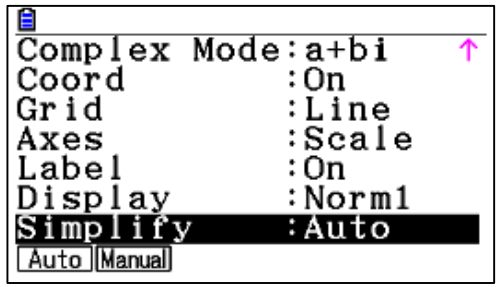




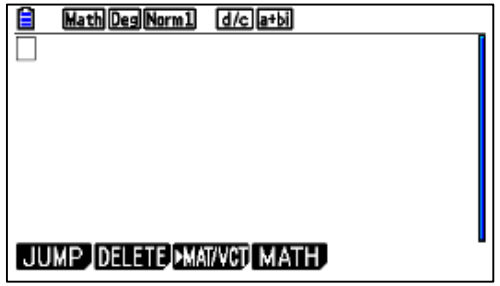
Math Setup : SHIFT MENU

This setup screen is just one possible example.
Actual setup screen content will differ according to the mode you are in and that mode's current settings.





EXIT To go back and exit from setup



F1 **Jump**: go through the screen (top, bottom, page up, page down).

F2 **Delete**: to delete data (line or all).

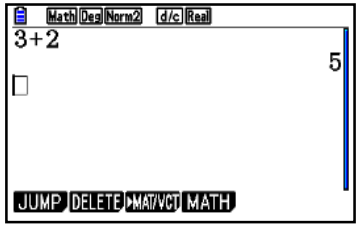
F3 **MAT\VCT**: to define Matrices or vectors only.

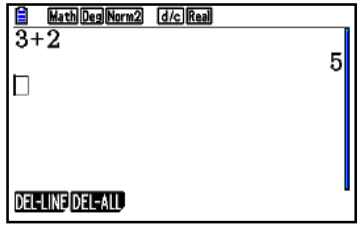
F4 **MATH**: Log, Abs, Calculus.

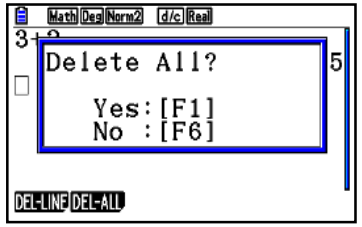
Deleting data from the screen:

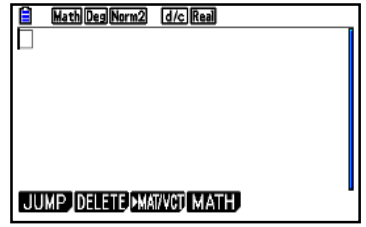
To delete data in Run Matrix mode:

- Make sure the menu tab look like figure-1- if it is not click EXIT
- Click the keys F2 F2 F1

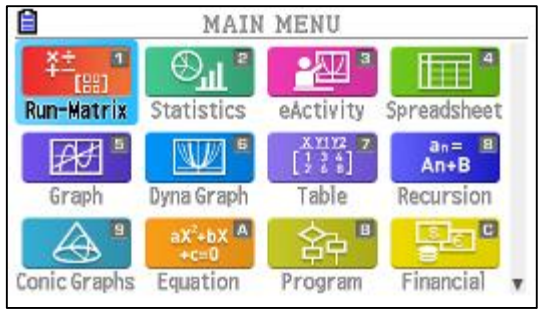


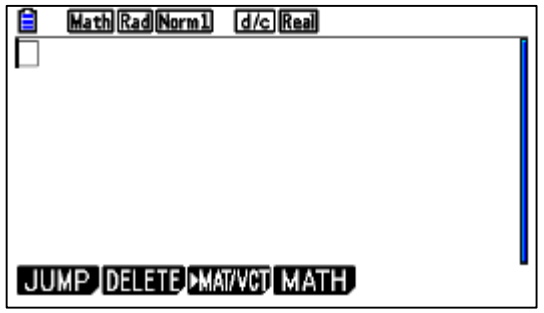




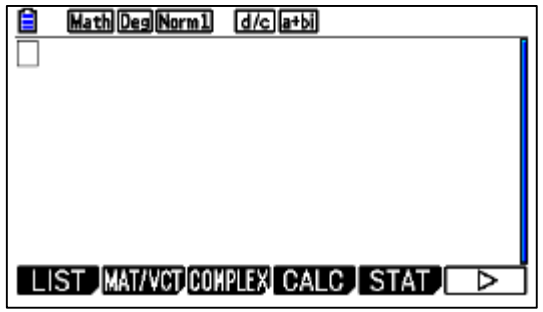


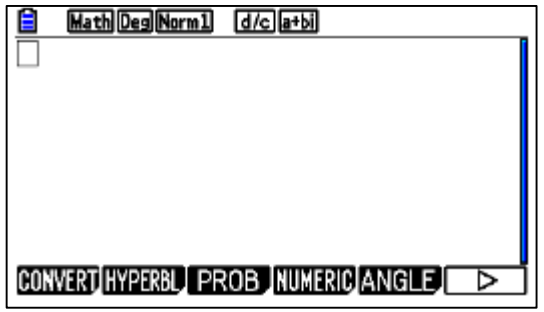
(Run-Matrix) Option button



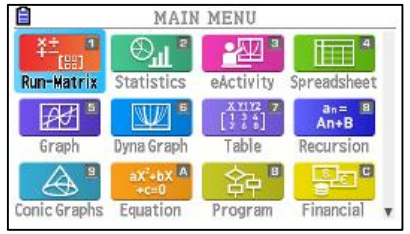


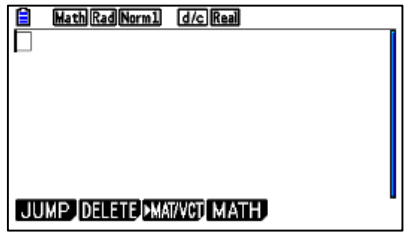
More Options OPTN





F1	**List**: Math & Stat Calculations on list(s).
F2	**MAT\VCT**: Matrices or vectors operations and calculations.
F3	**COMPLEX**: Complex numbers operations.
F4	**CALC**: Calculus operations, solve equations.
F5	**STAT**: Statistical calculations.
F6	**Next page**:
F1	**CONVERT**: conversions (length, volume, time, ….)
F2	**HYPERBL**: Hyperbolic functions (sinh, cosh,…).
F3	**PRON**: Probability operations (nCr, nPr).
F4	**NUMERIC**: Abs, integers, GCD,LCM, MOD.
F5	**ANGLE**: DMS.





Matrices Operations

Example:

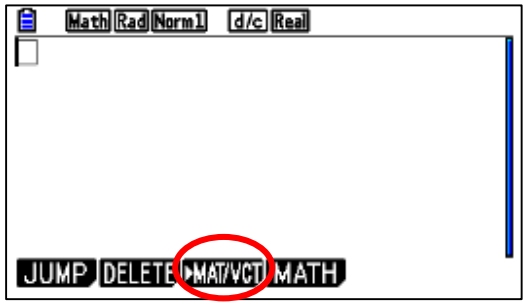
$$A=\begin{matrix}1 & 2\\ 3 & 4\end{matrix} \qquad B=\begin{matrix}3 & -2\\ 1 & 5\end{matrix}$$

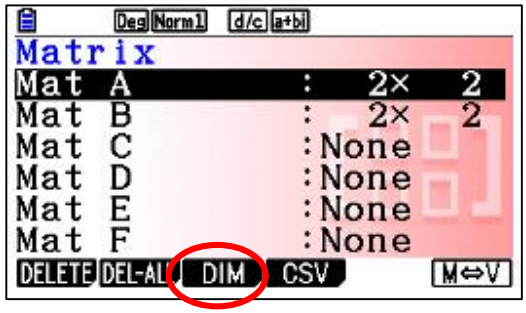
- Det A
- Tran B
- Mat A × Mat B
- Ref A
- Inverse B

To Define Mat A and Mat B

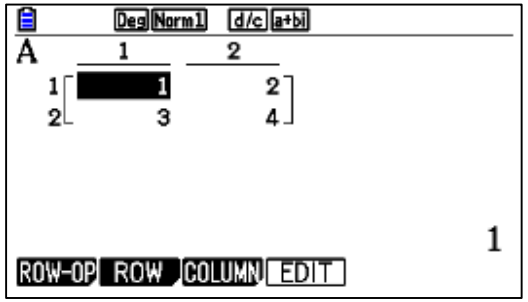
Mat A [F3] [F3] [2] [EXE] [2] [EXE] [EXE]

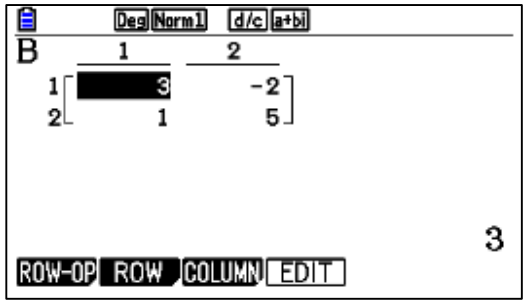
Mat B [EXIT] [▼] [F3] [2] [EXE] [2] [EXE] [EXE]





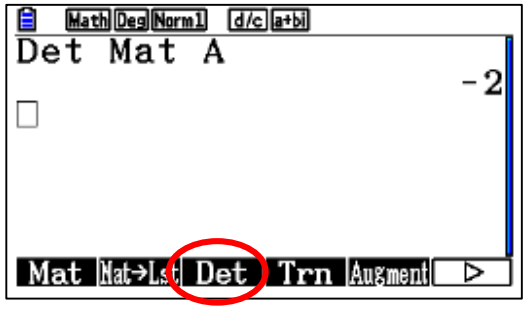
Fill the required data

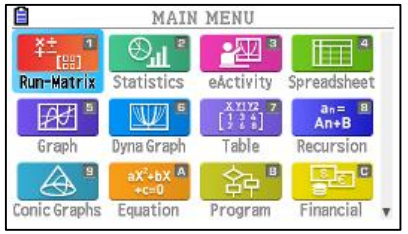


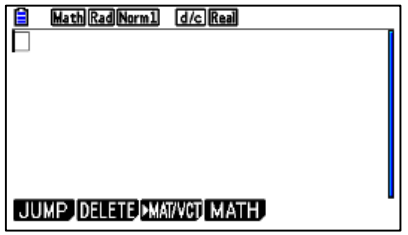


- To find the Det A:

[EXIT] [EXIT] [OPTN] [F2] [F3] [F1] [ALPHA] [X,θ,T] [EXE]







Matrices Operations

Example:

$$A=\begin{matrix}1 & 2\\ 3 & 4\end{matrix}$$

$$B=\begin{matrix}3 & -2\\ 1 & 5\end{matrix}$$

- Tran B
- Mat A × Mat B
- Ref A
- Inverse B

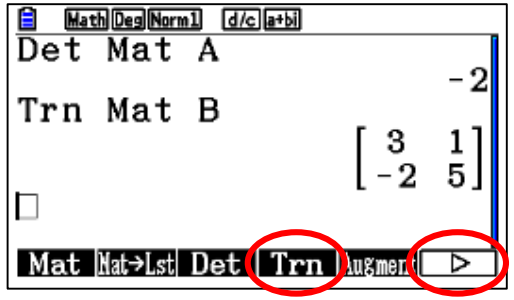
Exercise:

$$A=\begin{pmatrix}2 & -3 & 1\\ 2 & 0 & -1\\ 1 & 4 & 5\end{pmatrix}$$

$$B=\begin{pmatrix}1 & 3 & 2\\ -3 & -1 & -3\\ 2 & 3 & 1\end{pmatrix}$$

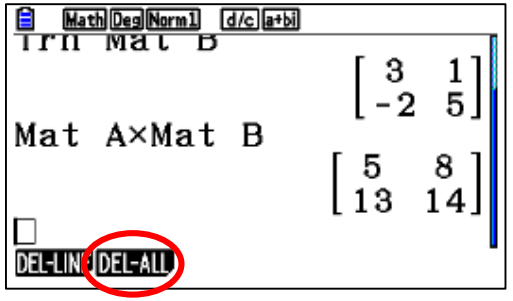
- To find the Tran B

F4 F1 ALPHA log EXE

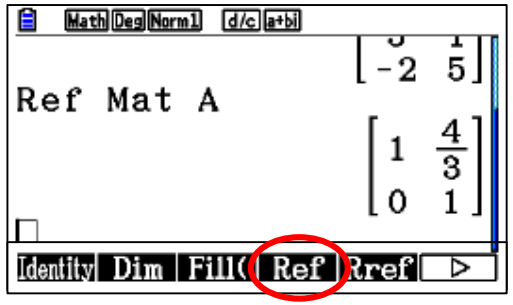


- Mat A × Mat B

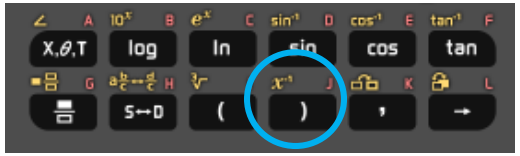
OPTN F2 F1 ALPHA X,θ,T × F1 ALPHA log EXE

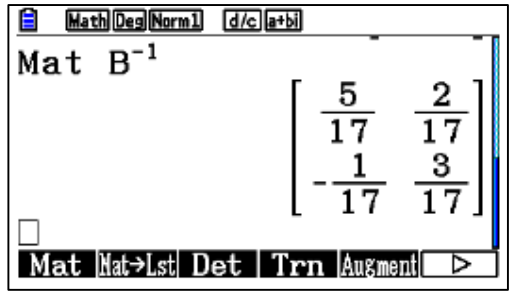


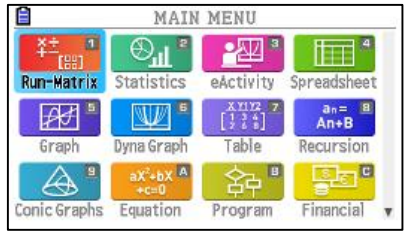
- Ref A F6 F4 F6 F6 F6 F1 ALPHA X,θ,T EXE

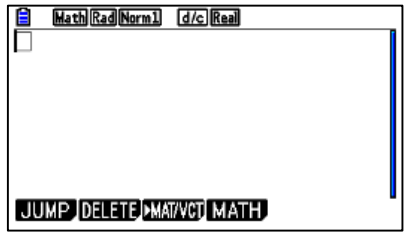


- Inverse B F1 ALPHA log SHIFT) EXE









Vectors Operations

Example:

A= 1 2 3

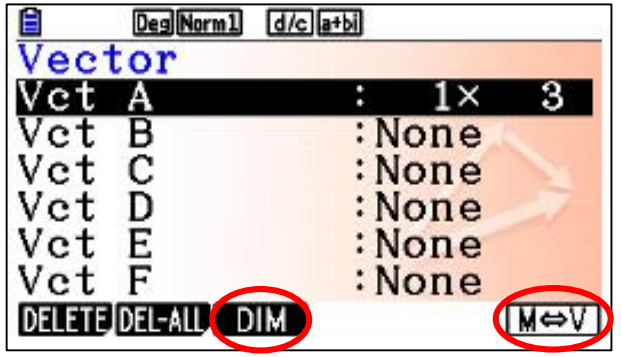
B= −1 −3 4

- Dot product
- Cross Product
- Angle between vectors

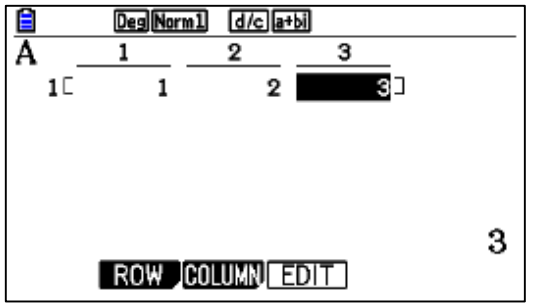
Define Vct A and Vct B

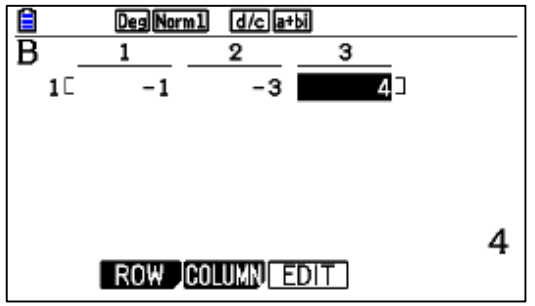
Vector A [F3] [F6] [F3] [1] [EXE] [3] [EXE] [EXE]

Vector B [EXIT] [▼] [F3] [1] [EXE] [3] [EXE] [EXE]

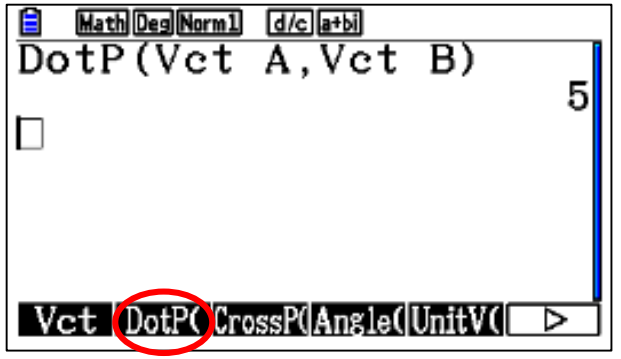


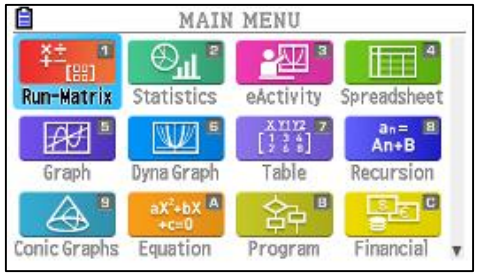
Fill the required data

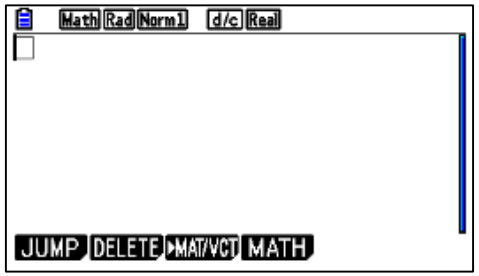




- Dot product [EXIT] [EXIT] [OPTN] [F2] [F6] [F6] [F2] [F1] [ALPHA] [X,θ,T] [,] [F1] [ALPHA] [log] [)] [EXE]







Vectors Operations

Example:

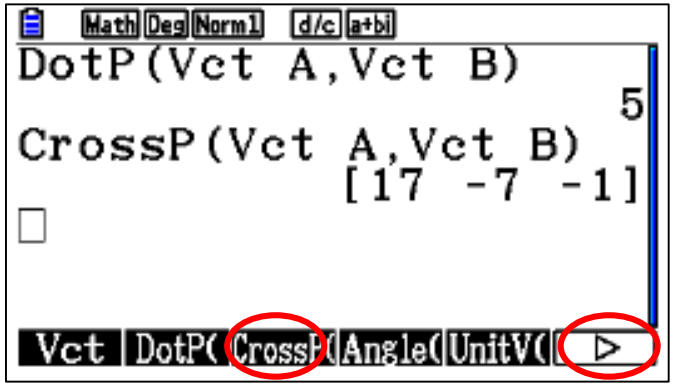
A= 1 2 3

B= −1 −3 4

- Cross Product
- Angle between vectors

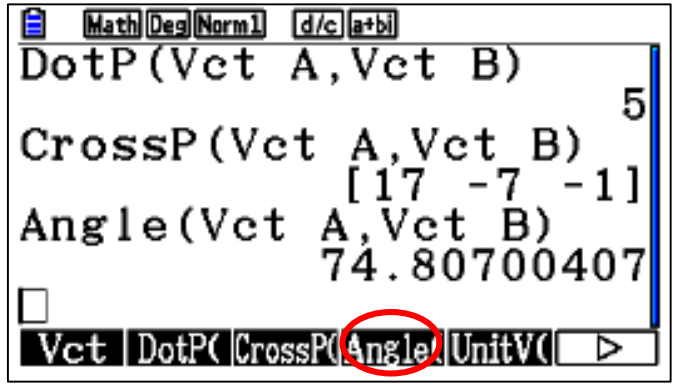
- Cross Product

F3 F1 ALPHA X,θ,T , F1 ALPHA log) EXE



- Angle between two vectors

F4 F1 ALPHA X,θ,T , F1 ALPHA log) EXE



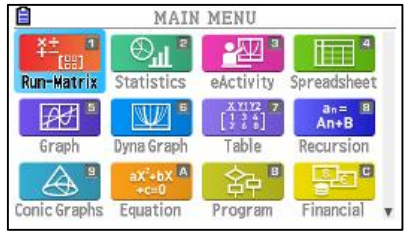
Exercise:

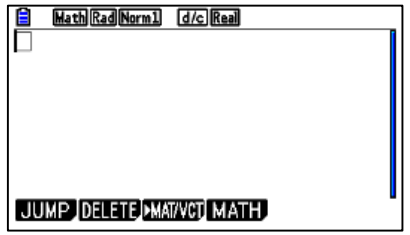
A= 2 1 3

B= −1 2 4

- Dot product
- Cross Product
- Angle between vectors

(Run-Matrix) Complex Numbers Operations





Complex Numbers Operations

Example:

$$A = \frac{\sqrt{3}}{2} + \frac{1}{2}i$$

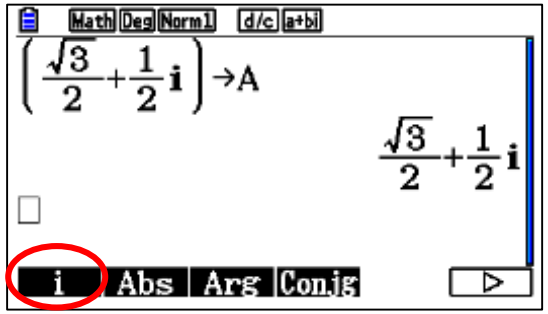
$$B = 1 - 5i$$

- A+B
- $A \times B$
- Argument (Angle) of A
- A in polar coordinate

- Define the complex numbers A & B

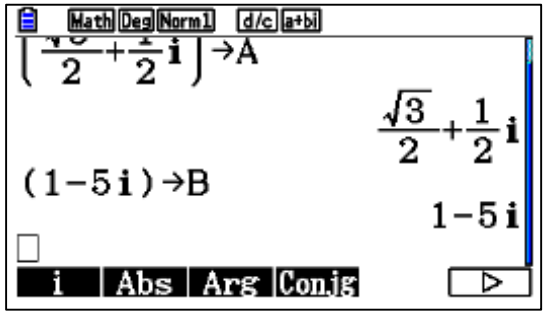
Number A

OPTN F3 (▭ SHIFT x^2 3 ▼ 2 ▶ + 1 ▭ 2 ▶ F1) → ALPHA X,θ,T EXE



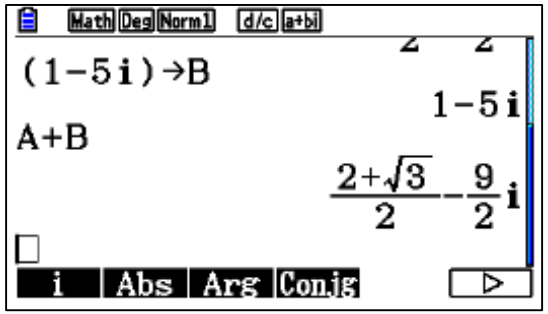
Number B

(1 − 5 F1) → ALPHA log EXE



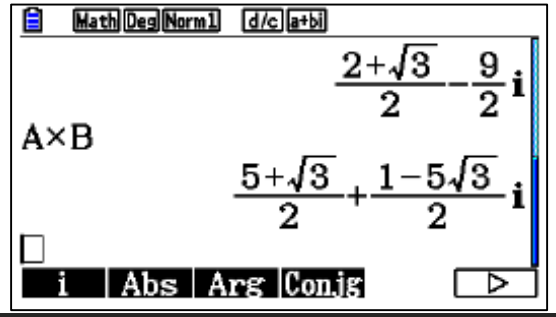
- $A + B$

ALPHA X,θ,T + ALPHA log EXE

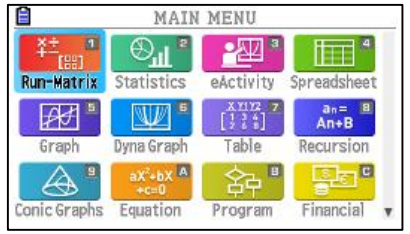


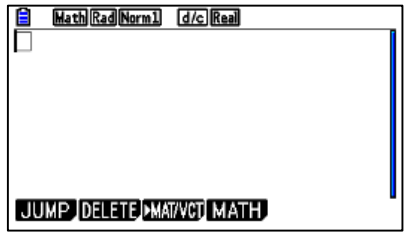
- $A \times B$

ALPHA X,θ,T × ALPHA log EXE



(Run-Matrix) Complex Numbers Operations





Complex Numbers Operations

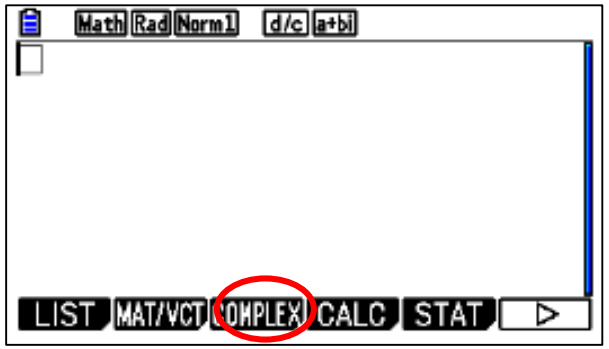
Example:

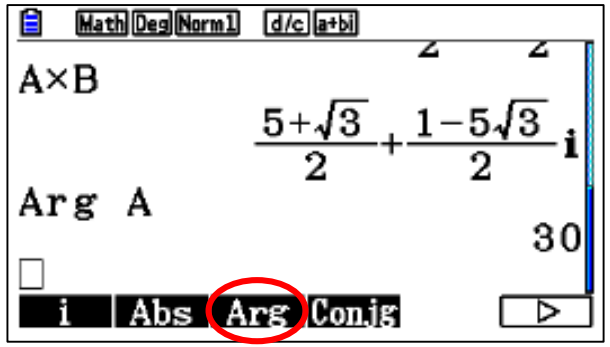
$$A= \frac{\sqrt{3}}{2}+\frac{1}{2}i$$

$$B= 1-5i$$

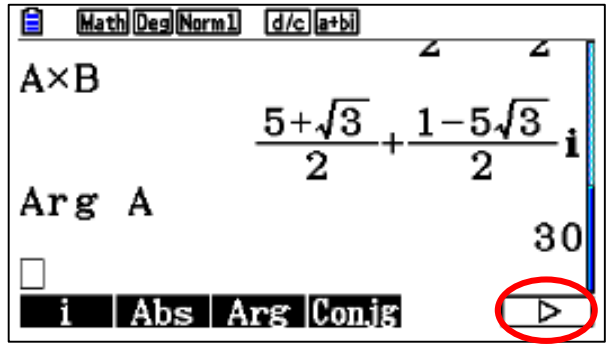
- A+B
- $A \times B$
- Argument (Angle) of A
- A in polar coordinate

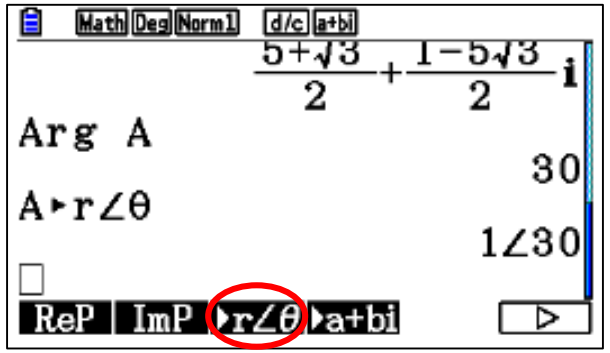
- Argument (Angle) of A **F3** **ALPHA** **X,θ,T** **EXE**





- A in polar coordinate **F6** **ALPHA** **X,θ,T** **F3** **EXE**



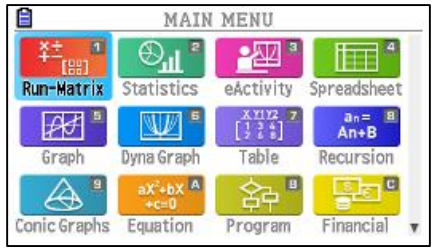


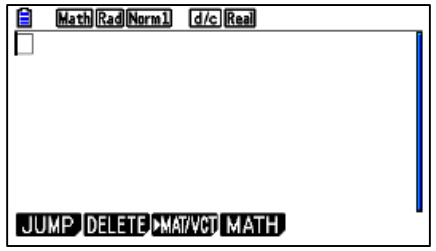
Exercise:

$$A= 2+2\sqrt{3}i$$

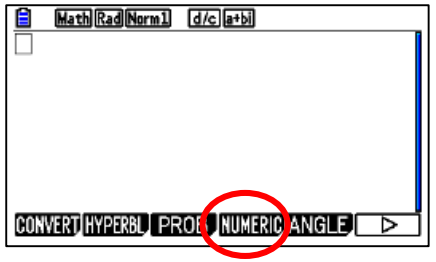
$$B= 3-i$$

- A+B
- $A \times B$
- Argument (Angle) of A
- A in polar coordinate





Numerical Operations

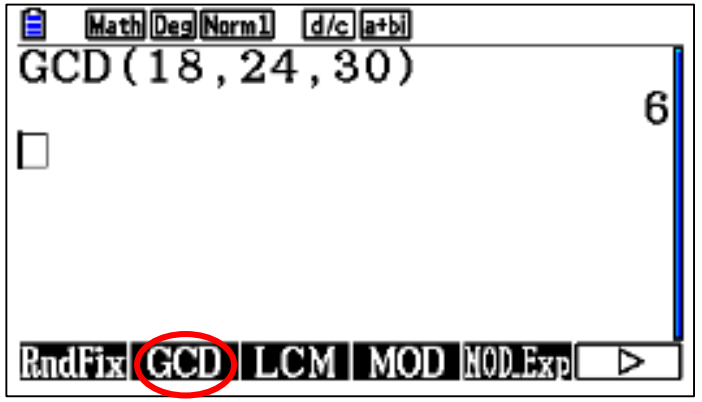


Example:

- GCD
- LCM
- MOD

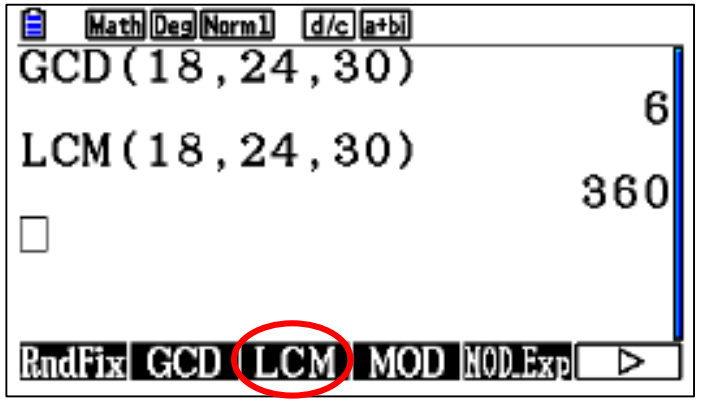
- GCD (18,24,30)

OPTN F6 F4 F6 F2 1 8
, 2 4 , 3 0) EXE



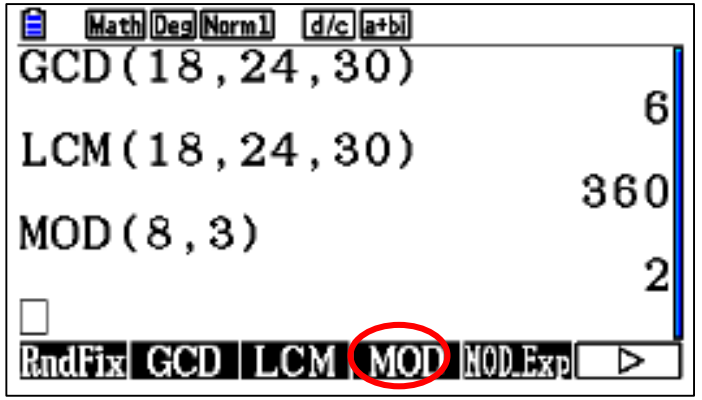
- LCM (18,24,30)

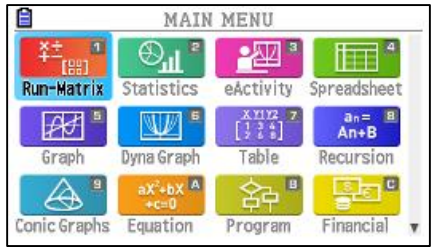
F3 1 8 , 2 4 , 3 0) EXE

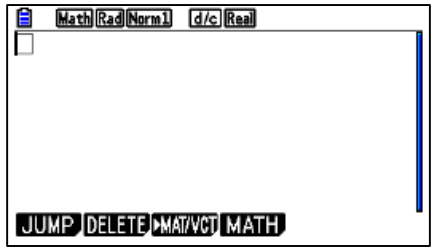


- MOD (8,3)

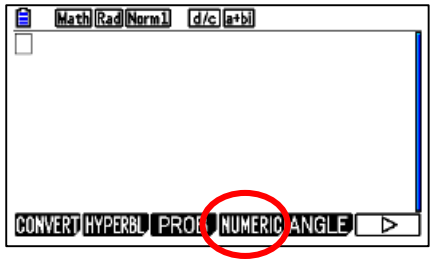
F4 8 , 3) EXE







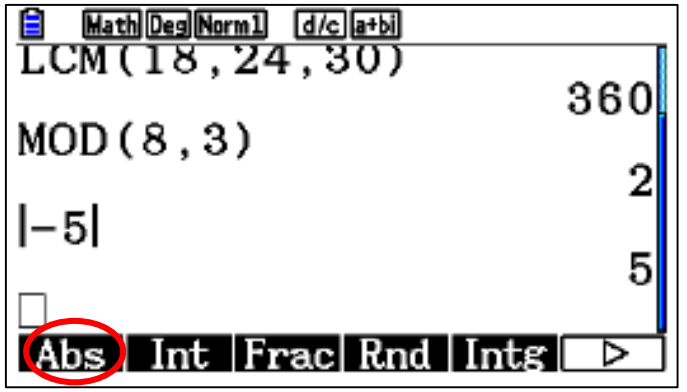
Numerical Operations



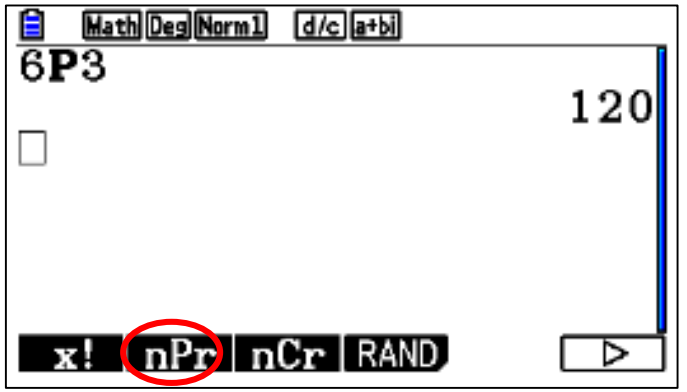
Example:

- Absolute
- Permutation
- Combination

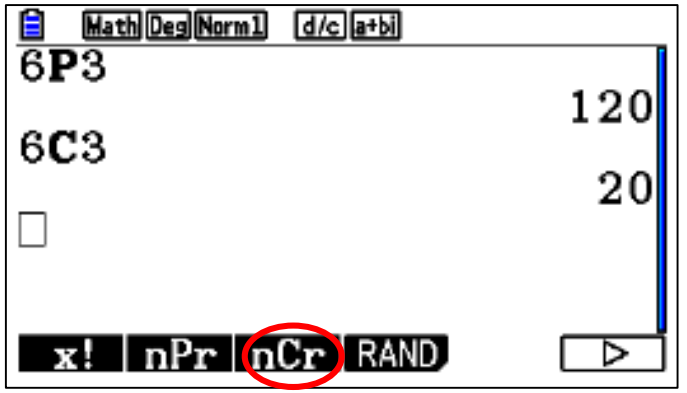
- Abs (-5)
  F6 F1 (−) 5 EXE

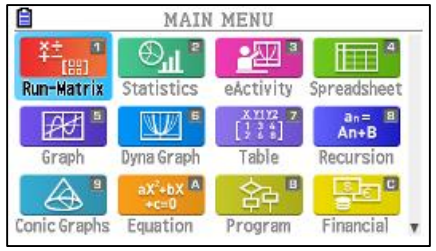


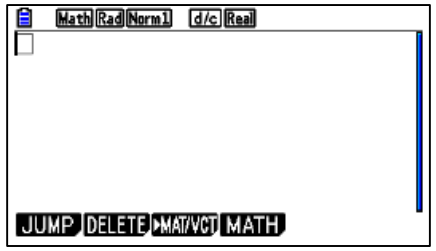
- 6P3 EXIT F3 6 F2 3 EXE



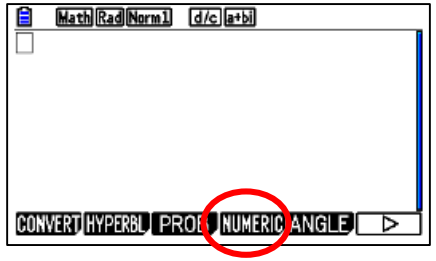
- 6C3 6 F3 3 EXE







Numerical Operations

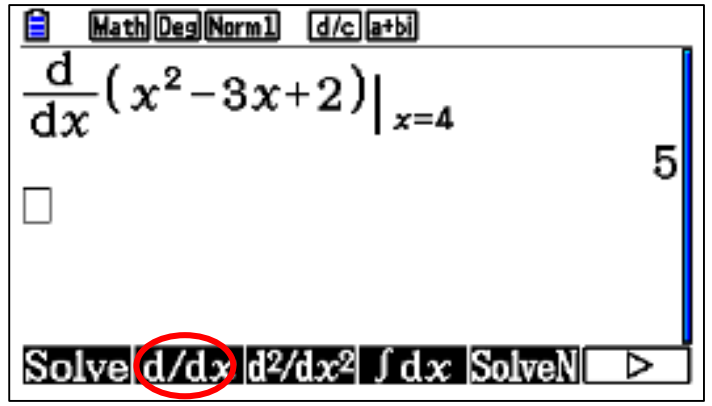


Example:

- **Calculus**

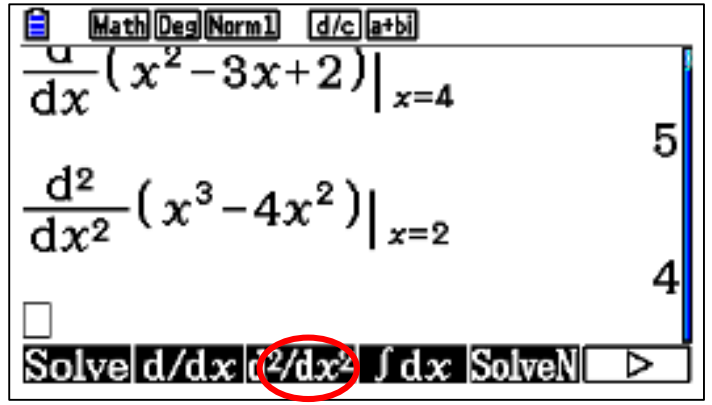
1st Derivative

OPTN F4 F2 X,θ,T x^2 − 3 X,θ,T + 2 ▶ 4 EXE



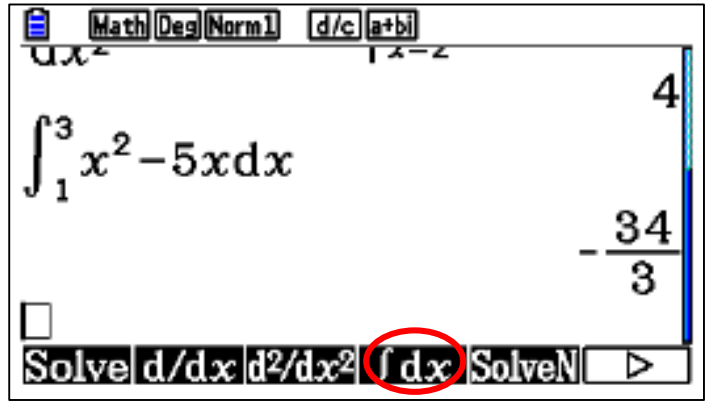
2nd Derivative

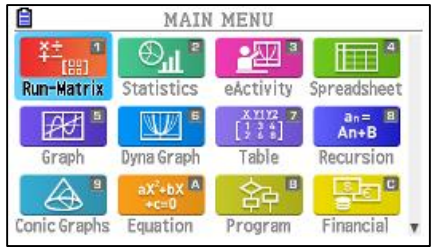
F3 X,θ,T ^ 3 ▶ − 4 X,θ,T x^2 ▶ 2 EXE

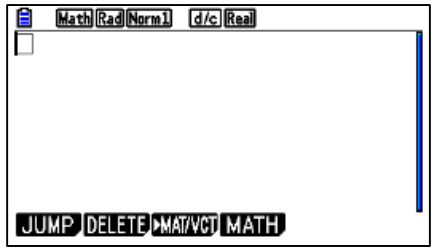


Integration

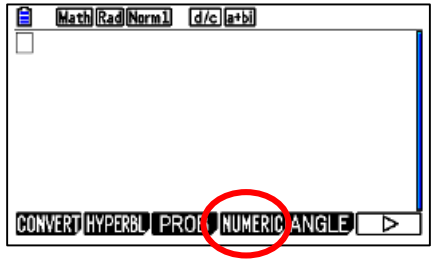
F4 X,θ,T x^2 − 5 X,θ,T ▶ 1 ▶ 3 EXE







Numerical Operations

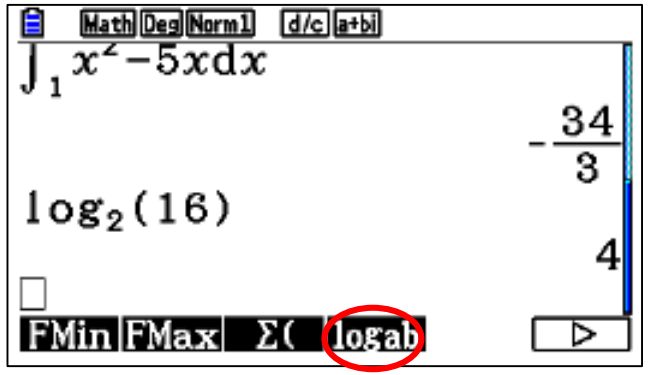


Example:

- Log
- Sum
- Min & Max

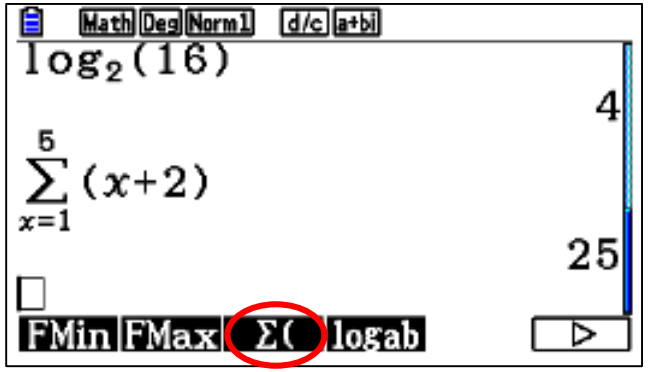
- Log

F6 F4 2 ▶ 1 6 EXE



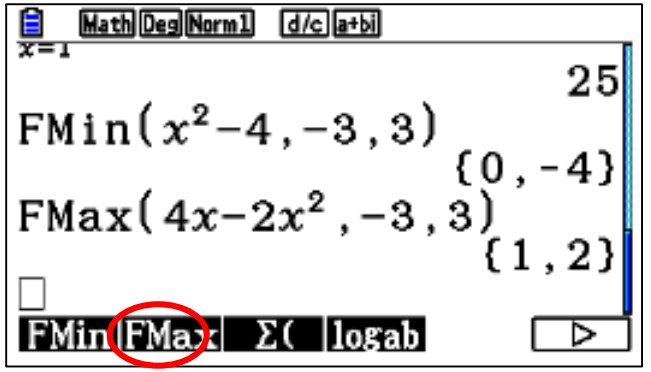
- Sum

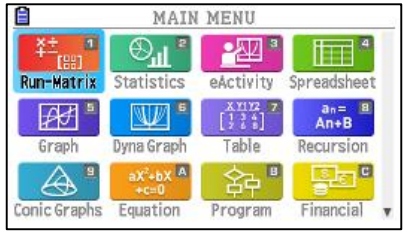
F3 X,θ,T + 2 ▶ X,θ,T ▶ 1 ▶ 5 EXE

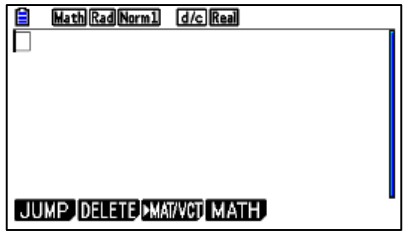


- Min & Max

F1 X,θ,T x^2 − 4 , − 3 , 3) EXE F2
4 X,θ,T − 2 X,θ,T x^2 , − 3 , 3) EXE







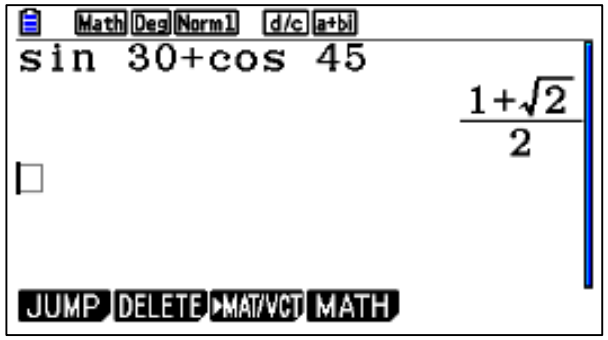
Numerical Operations

Example:

- Trigonometric
- Hyperbolic Functions

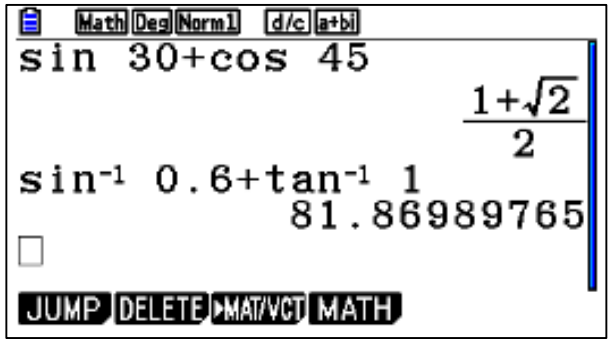
- $\sin(30) + \cos(45)$

sin 3 0 + cos 4 5 EXE



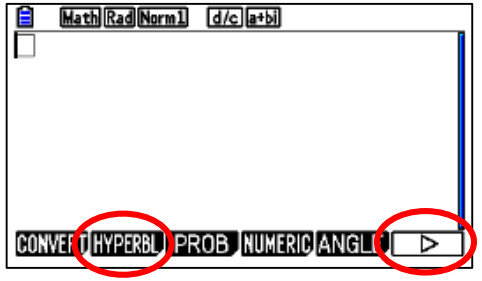
- $\sin^{-1} 0.6 + \tan^{-1} 1$

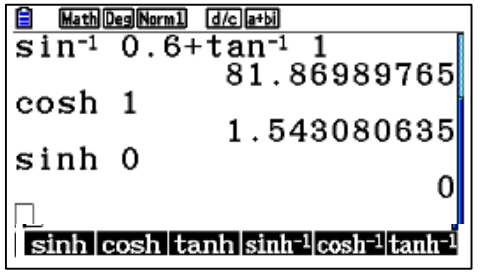
SHIFT sin 0 • 6 + SHIFT tan 1 EXE



- Hyperbolic Functions

OPTN F6 F2 F2 1 EXE F1 0 EXE

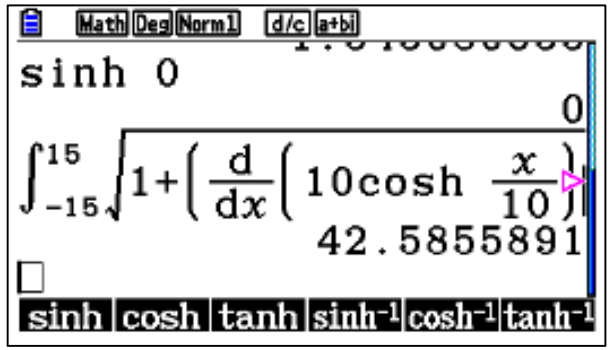




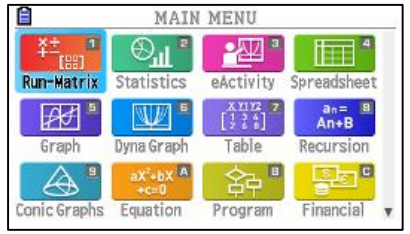
Ex: Assume a hanging cable has the shape $\mathbf{10\cosh}(\frac{x}{10})$ for $-15 \le x \le 15$, where x is measured in feet. Determine the length of the cable.

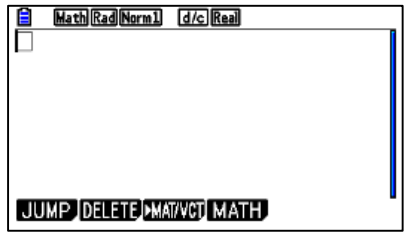
$$Arc\ Length = \int \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$$

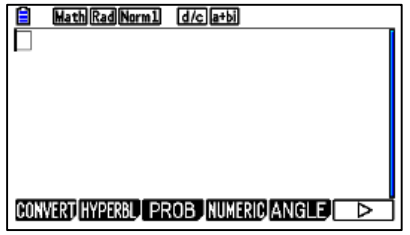
EXIT F6 F6 F4 F4 SHIFT x^2 1 + (F2 1 0 EXIT F6 F2 F2
X,θ,T ▣ 1 0 ▶ ▶ X,θ,T ▶) x^2 ▶ − 1 5 ▶ 1 5 EXE

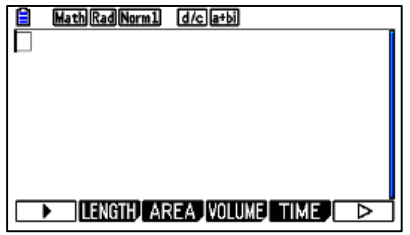


(Run-Matrix) Units conversion Operations







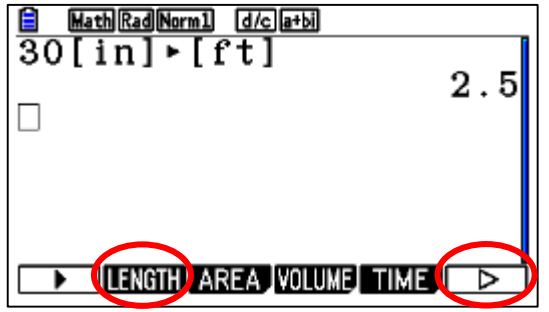


Example:

- Convert units
- Length
- Temperature
- Power
- Velocity

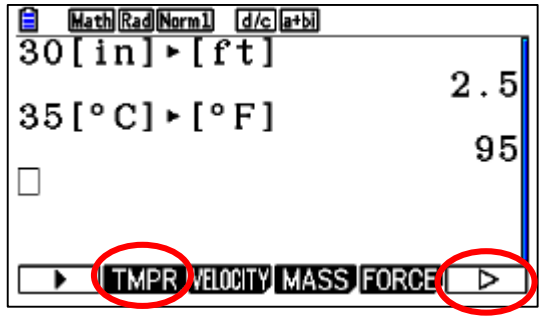
- 30 in to ft

OPTN F6 F1 3 0 F2 ▼ EXE F1 F2 ▼ ▼ EXE EXE



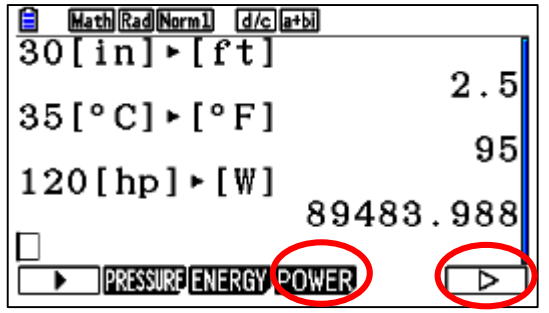
- 35 C to F

F6 3 5 F2 EXE F1 F2 ▼ ▼ EXE EXE



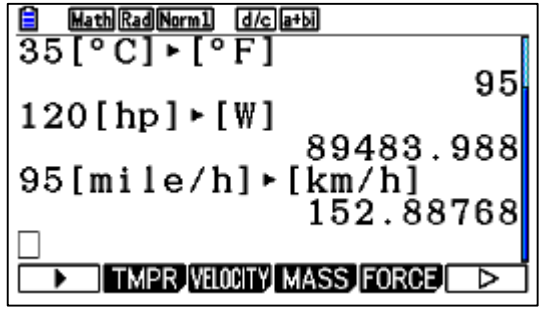
- 120 hp to w

F6 1 2 0 F4 ▼ ▼ EXE F1 F4 EXE EXE

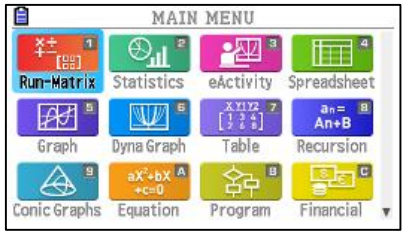


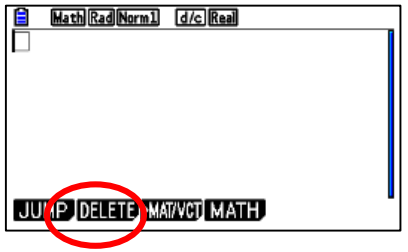
- 95 mile\h to km\h

F6 F6 9 5 F3 ▼ ▼ ▼ ▼ EXE F1 F3 ▼ EXE EXE



EQUATIONS





Solving Equation using SolveN

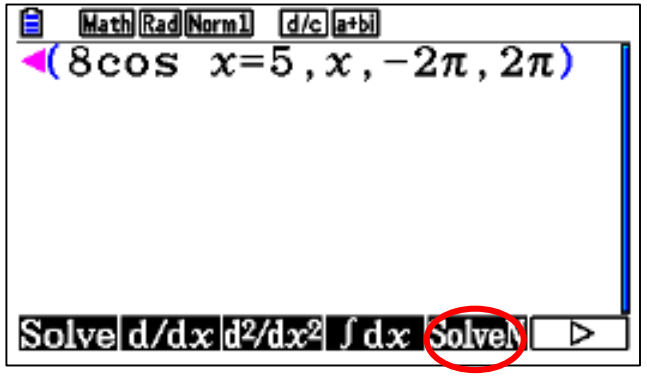
Examples:

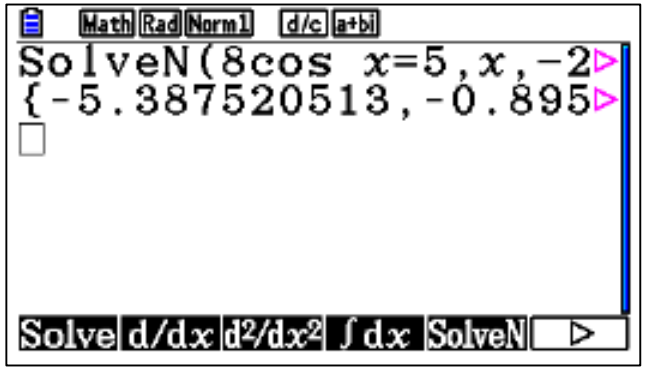
1) $8\cos\theta = 5,\ -2\pi \le x \le 2\pi$

2) $Sin\ 3x = \frac{\sqrt{3}}{2},\ 0 \le x \le 2\pi$

1) $8\cos\theta = 5, \quad -2\pi \le x \le 2\pi$

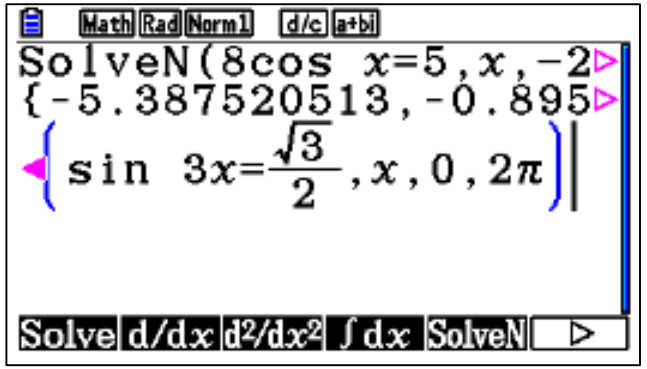
OPTN F4 F5 8 cos X,θ,T SHIFT • 5 , X,θ,T , − 2 SHIFT ×10^x , 2 SHIFT ×10^x) EXE EXIT

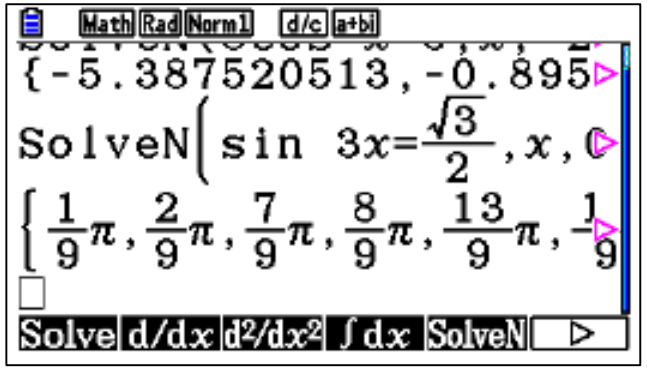


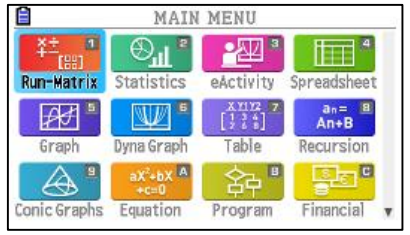


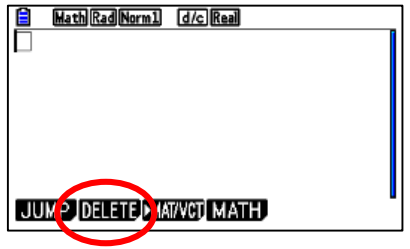
2) $Sin\ 3x = \frac{\sqrt{3}}{2}, \quad 0 \le x \le 2\pi$

F5 sin 3 X,θ,T SHIFT • SHIFT x² 3 ▶ ▤ 2 ▶ , X,θ,T , 0 , 2 SHIFT ×10^x) EXE EXIT









Solving Equation using SolveN

Examples:

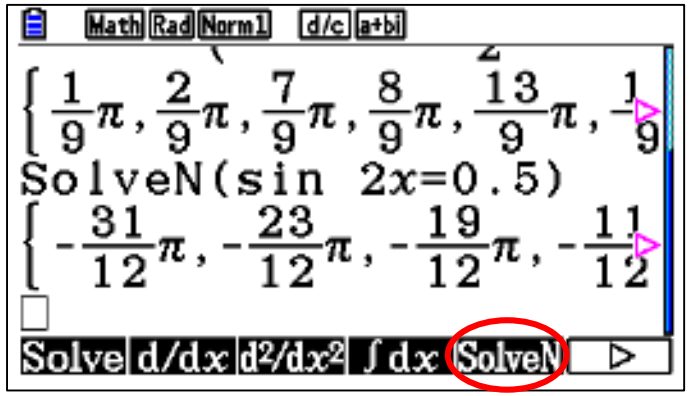
1) $Sin2x = 0.5$

2) $|x - 1| = 5$

3) $3e^{2x} = 12$

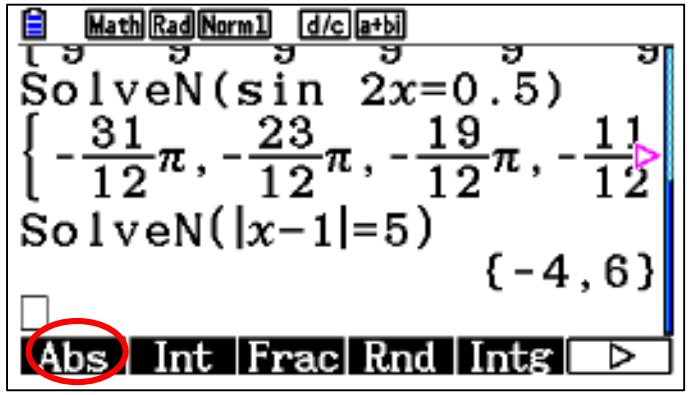
1) $Sin2x = 0.5$

F5 sin 2 X,θ,T SHIFT • 0 • 5) EXE EXIT



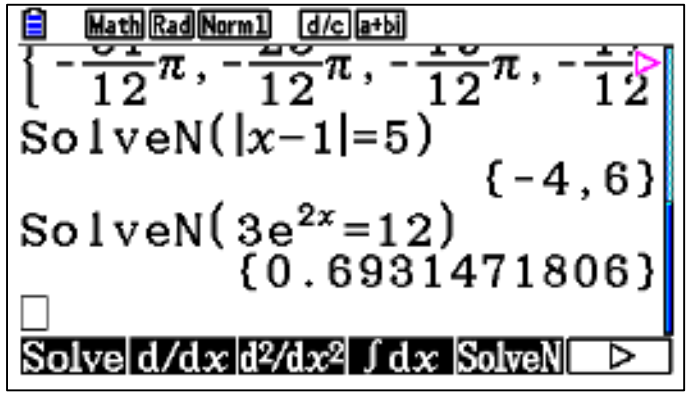
2) $|x - 1| = 5$

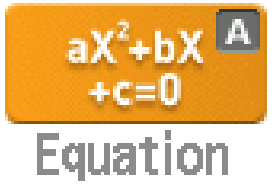
F5 EXIT F6 F4 F1 X,θ,T − 1 ▶ SHIFT • 5) EXE EXIT

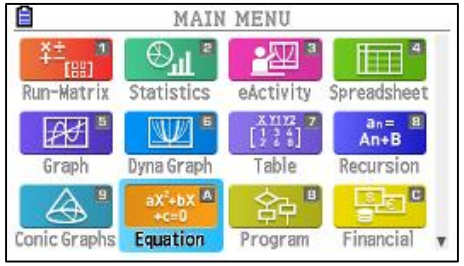


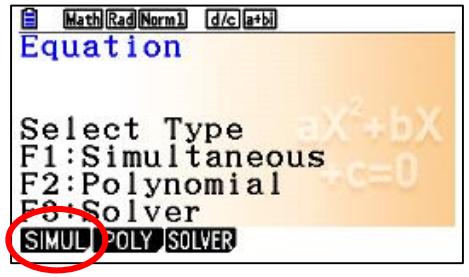
3) $3e^{2x} = 12$

EXIT F6 F6 F4 F5 3 SHIFT ln 2 X,θ,T ▶ SHIFT • 1 2) EXE EXIT









1. **F1:Simultaneous** (System of equations) (up to 6 unknowns)
2. **F2:Polynomial** up to degree 6.
3. **F3:Solver**, any user defined equation.

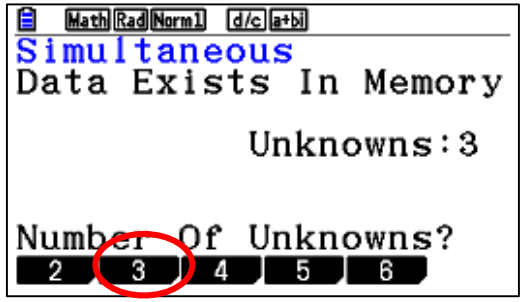
In this example we will use a system of 2 equation with 2 unknowns

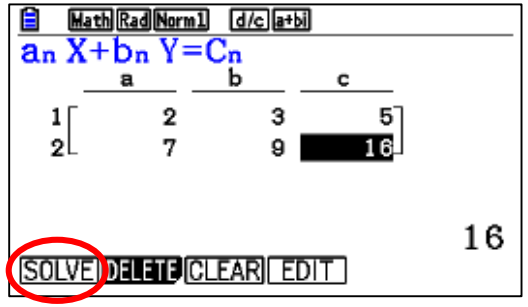
$$\begin{cases} 2x + 3y = 5 \\ 7x + 9y = 16 \end{cases}$$

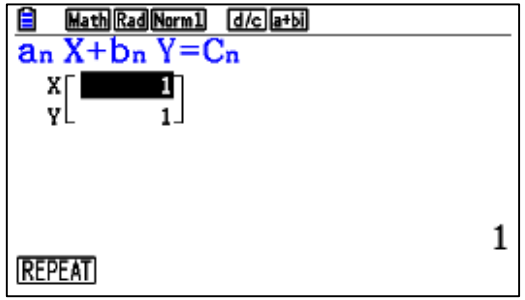
Select the simultaneous equations and number of unknowns

F1 F1 2 EXE 3 EXE 5 EXE 7 EXE 9 EXE 1 6 EXE EXE

the calculator will automatically insert coefficients from left to right row by row

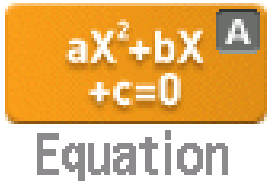


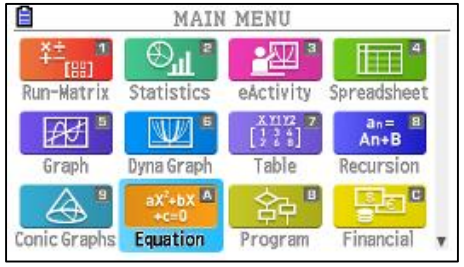


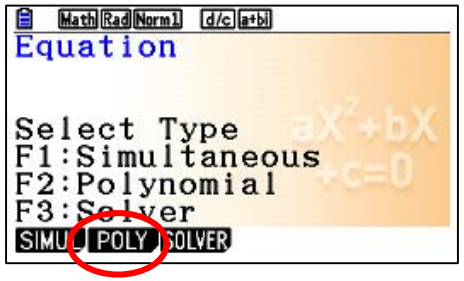


Exercise: Solve the system of equation \ Matrix below by using fx-CG50

$$\begin{aligned} 5x + y - 4z &= 5 \\ 2x - 3y - 5z &= 2 \\ 7x + 2y - 6z &= 5 \end{aligned} \quad \Rightarrow \quad \begin{pmatrix} 5 & 1 & -4 \\ 2 & -3 & -5 \\ 7 & 2 & -6 \end{pmatrix} \times \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \\ 5 \end{pmatrix}$$





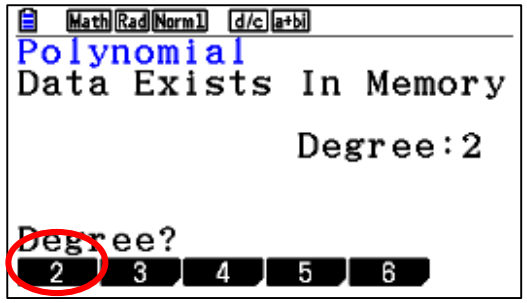


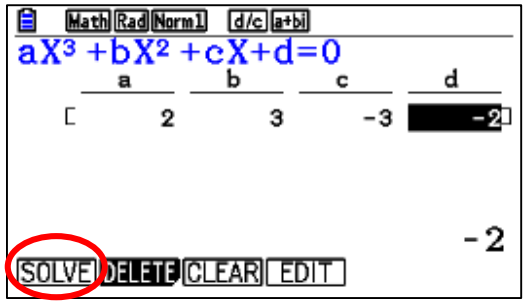
1. **F1:Simultaneous** (System of equations) (up to 6 unknowns)
2. **F2:Polynomial** up to degree 6.
3. **F3:Solver**, any user defined equation.

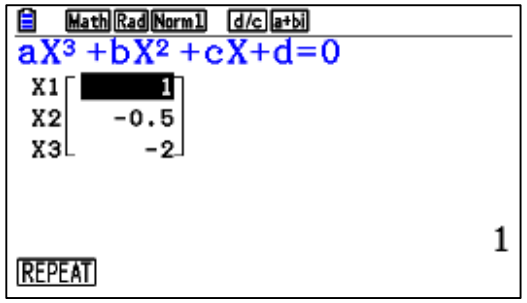
In this example we will solve and equation of degree 3

$$2x^3 + 3x^2 - 3x - 2 = 0$$

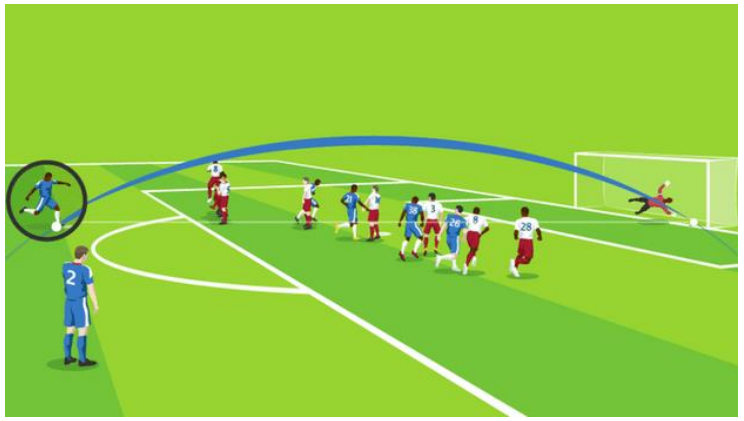
EXIT EXIT F2 F2 2 EXE 3 EXE − 3 EXE − 2 EXE EXE







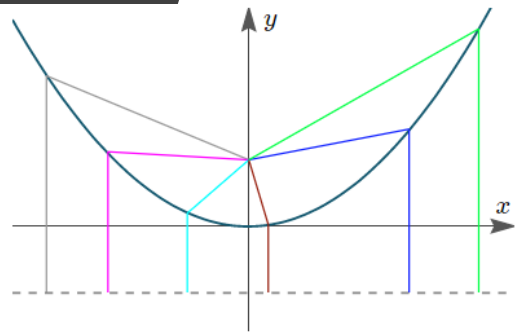
Exercise: Below figure is a free kick, the ball thrown by the played and then hit the ground inside the goal, the ball path is given by : $f(x) = 15 + 22x - 5x^2$, when it will hit the ground?

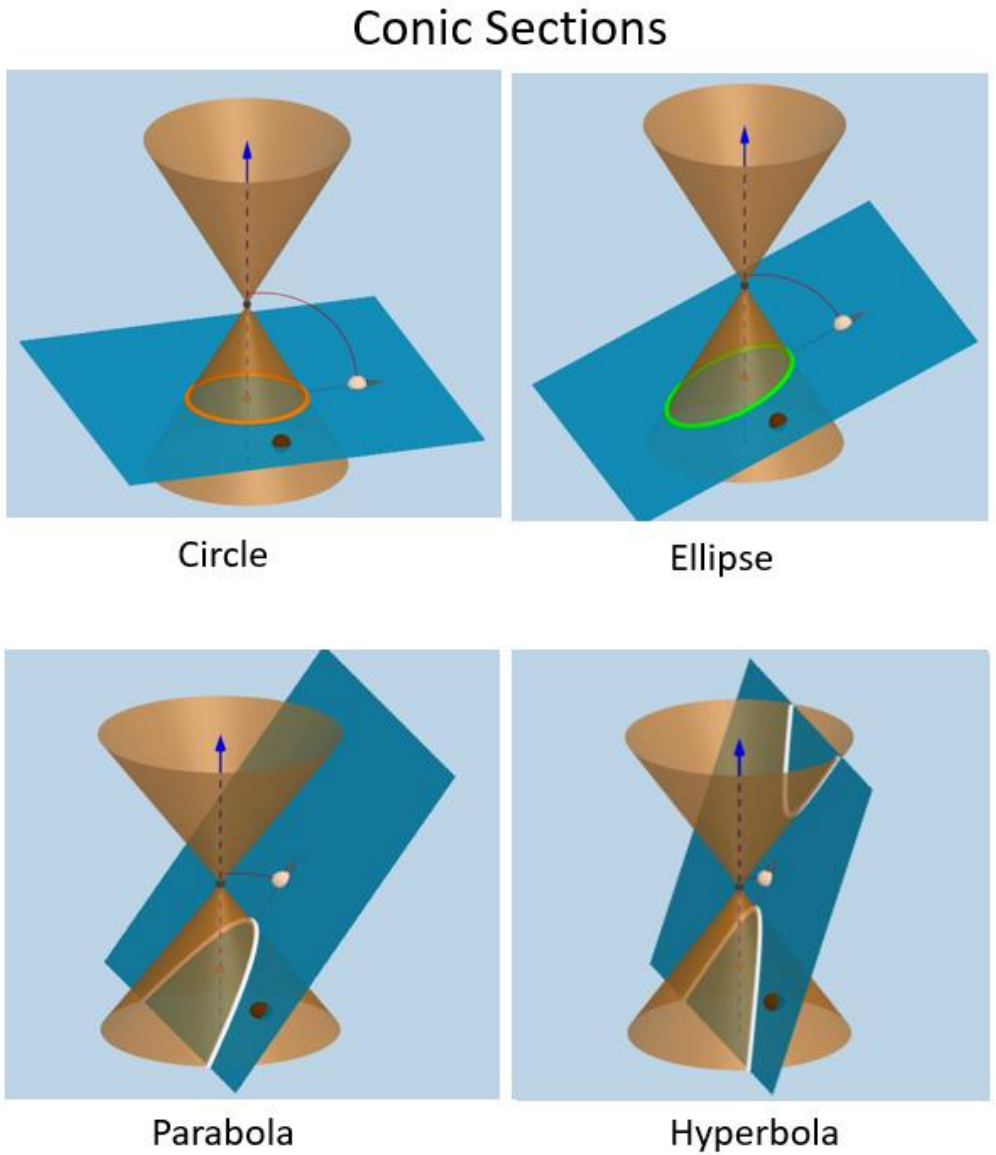



Break
Time!!


15
MIN

Conic Graphs



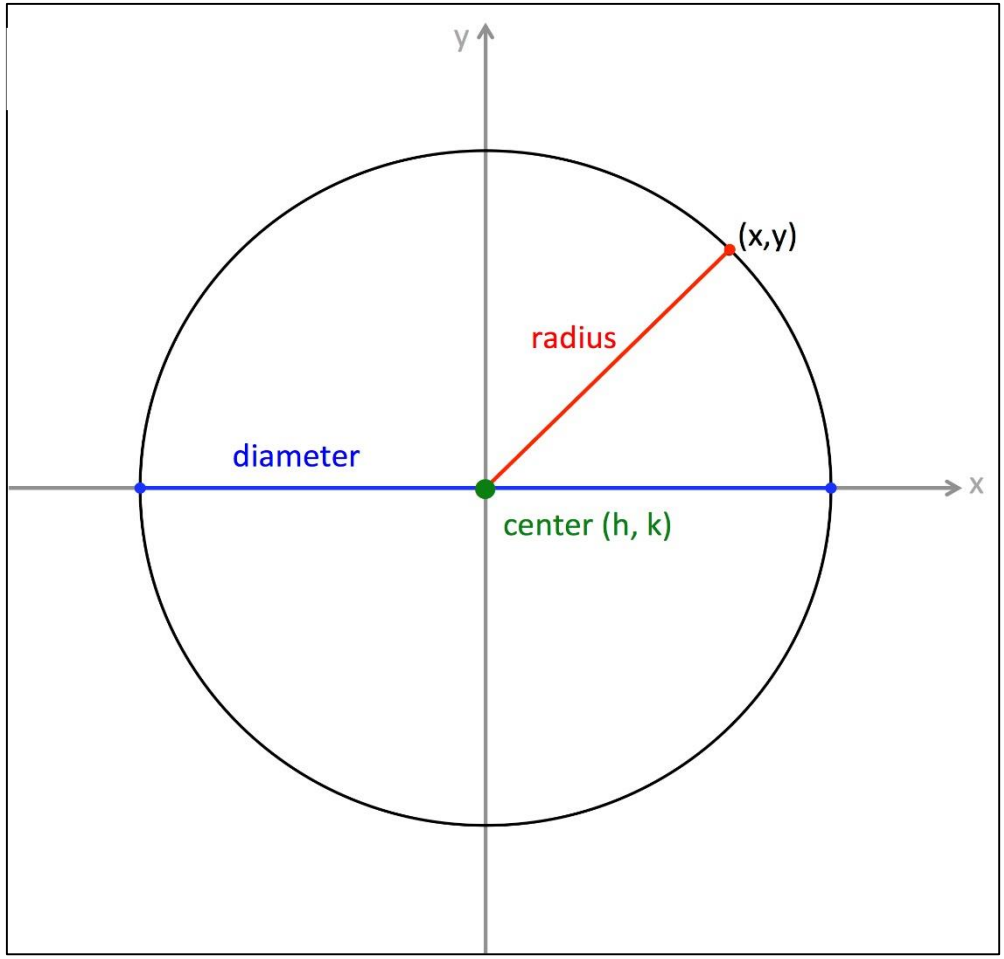


A **circle** is the set of all points in a plane at a given distance (called the radius) from a given point (called the center.)

General Form $x^2 + y^2 + 2hx + 2ky + c = 0$

$$r = \sqrt{h^2 + k^2 - c}$$

$$center\ (-h, -k)$$



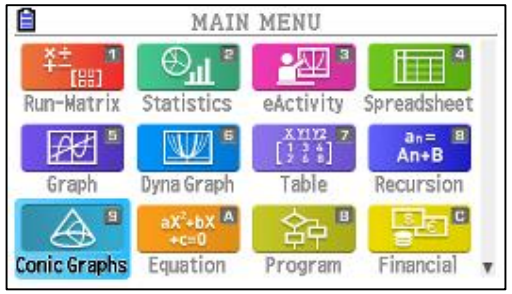
Standard Form $(x - h)^2 + (y - k)^2 = r^2$

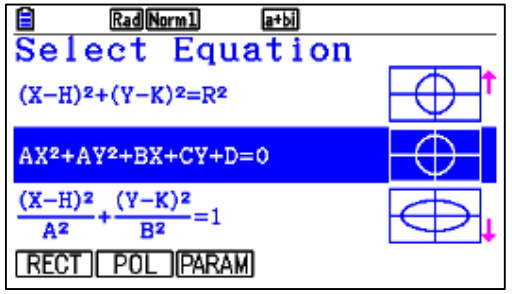
Example: Find center and radius for the following equation:

$$x^2 + y^2 - 2x - 4y - 4 = 0$$

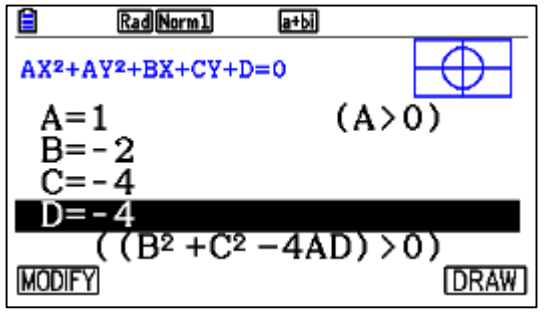
1. Go to Conics and select the formula

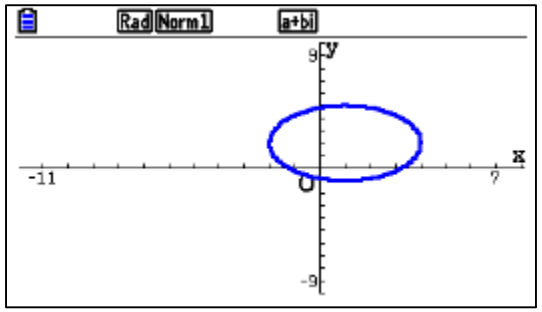
MENU 9 ▼ ▼ ▼ EXE



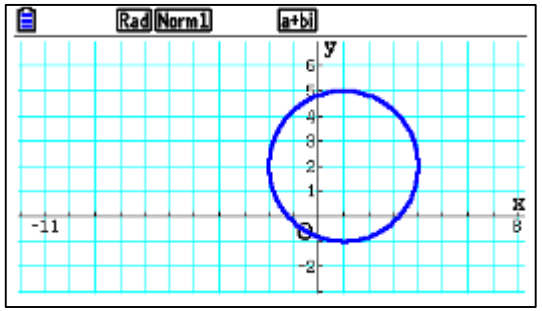


2. Fill the data and draw the graph 1 EXE (−) 2 EXE (−) 4 EXE (−) 4 EXE F6

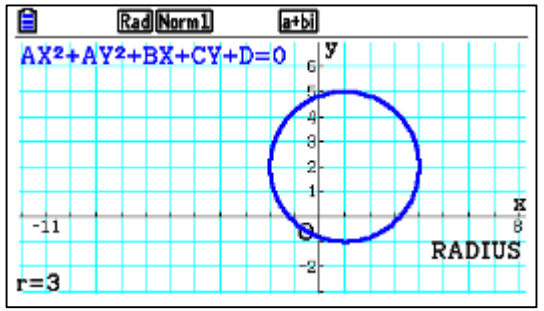




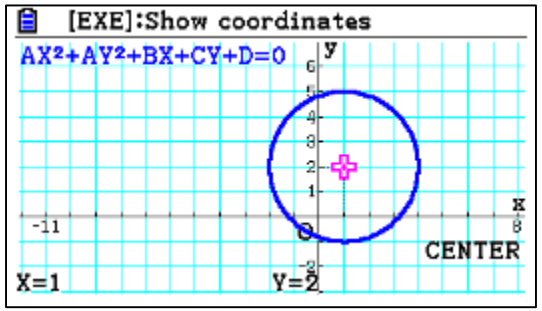
3. Modify the V-Windows F3 F5 F1 EXIT EXIT F6 + ▲



4. To find the radius : F5 F2



5. To find the center : F5 F1

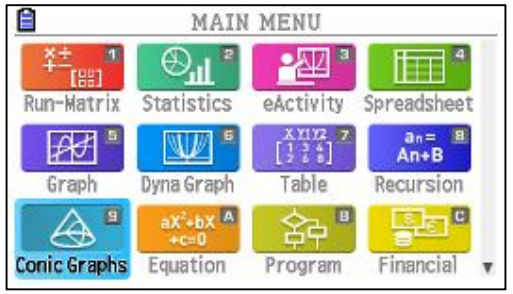


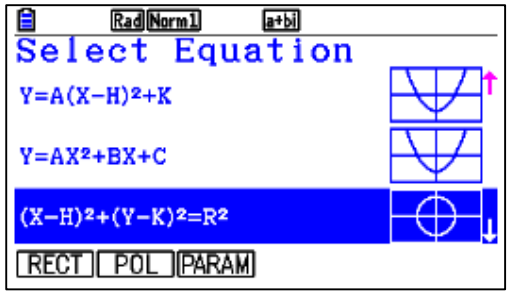
Example: Find center and radius for the following equation:

$$(x-4)^2 + (y+2)^2 = 25$$

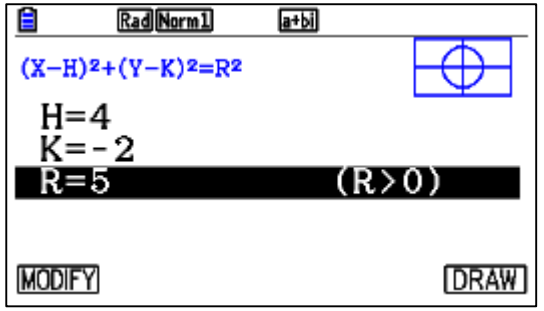
1. Go to Conics and select the formula

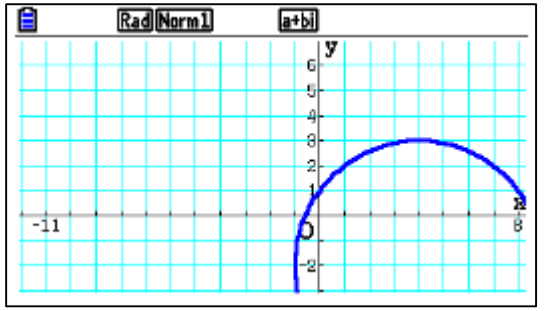
MENU 9 ▼ ▼ ▼ ▼ EXE



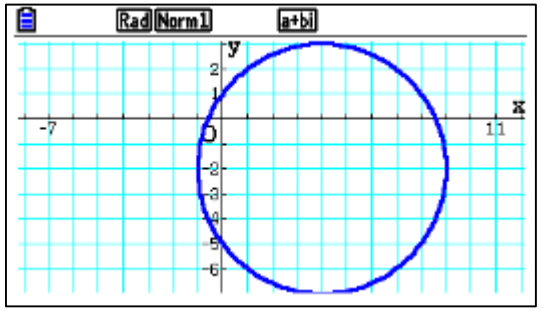


2. Fill the data and draw the graph 4 EXE (−) 2 EXE 5 EXE F6

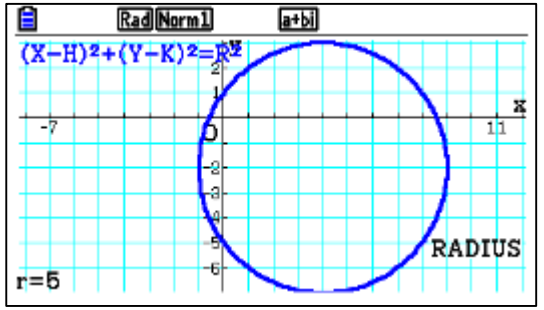




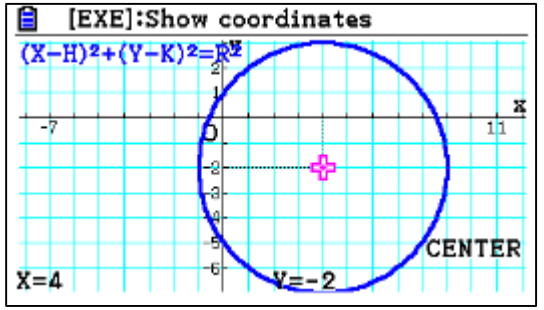
3. Modify the V-Windows F3 F5 F1 EXIT EXIT F6 (−) ▶ ▼ (+)



4. To find the radius : F5 F2

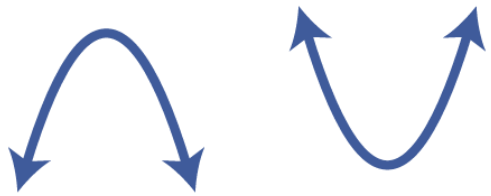


5. To find the center : F5 F1



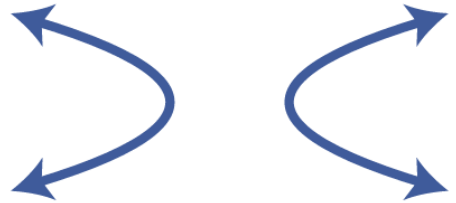
Parabolas are commonly known as the graphs of quadratic functions. They can also be viewed as the set of all points whose distance from a certain point (the **focus**) is equal to their distance from a certain line (the **directrix**).

$$y = ax^2 + bx + c$$
$$y = a(x-h)^2 + k$$

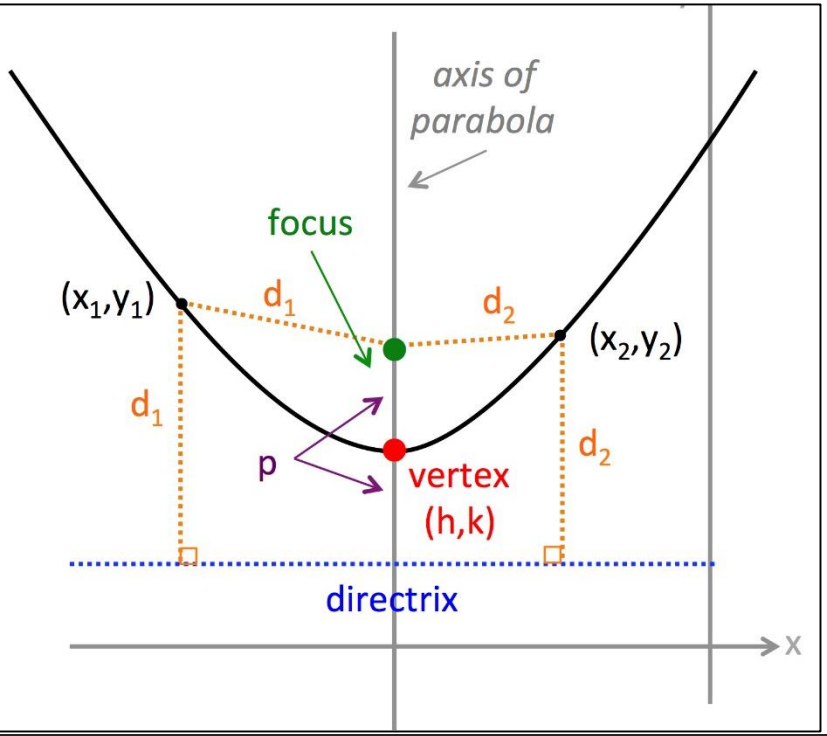


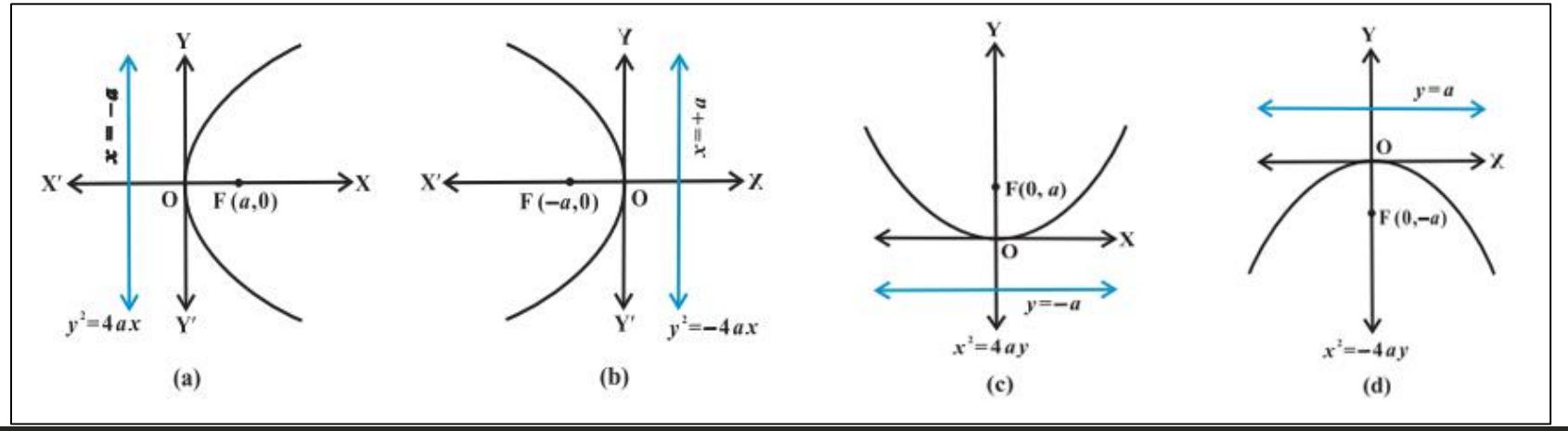
$a < 0$ $\quad a > 0$

$$x = ay^2 + by + c$$
$$x = a(y-k)^2 + h$$



$a < 0$ $\quad a > 0$





Example: Find focus, vertex, symmetry, and Directrix for the following equation:

$$(y-1)^2 = 8(x+4)$$

a. Write the equation as the calculator's formula

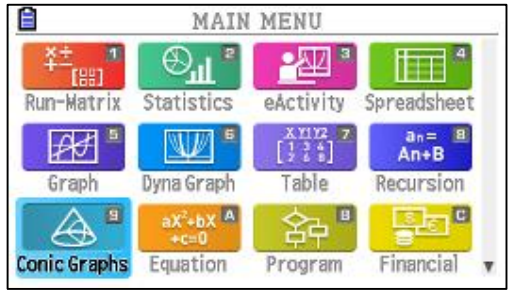
$$x = \frac{1}{8}(y-1)^2 - 4$$

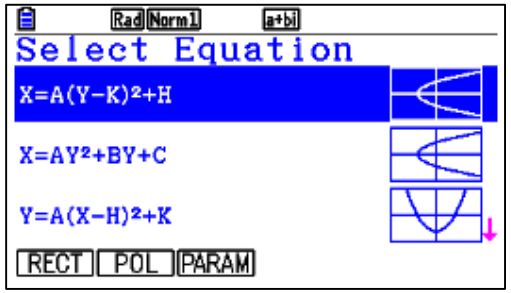
b. Find the required values from the equation as below

$$A = \frac{1}{8}, K = 1, H = -4$$

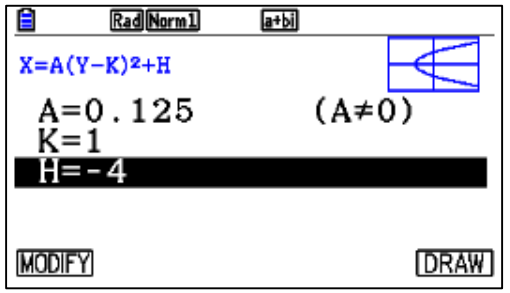
c. By using CASIO fx-CG50 Calculator:

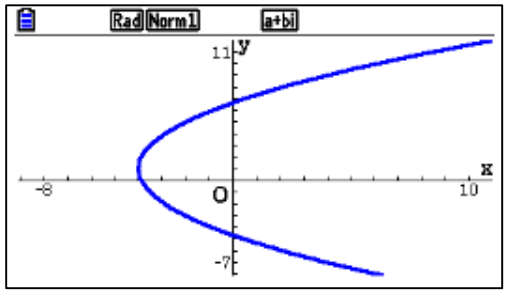
1. Go to Conics and select the formula MENU 9 EXE



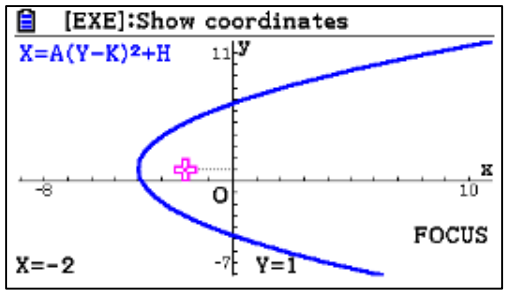


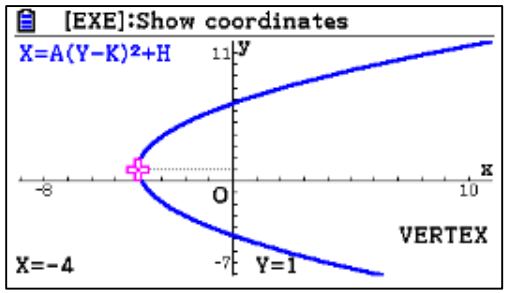
2. Fill the data and draw the graph EXE 1 ▼ 8 EXE 1 EXE − 4 EXE F6



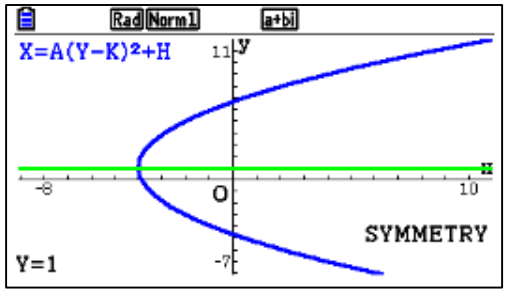


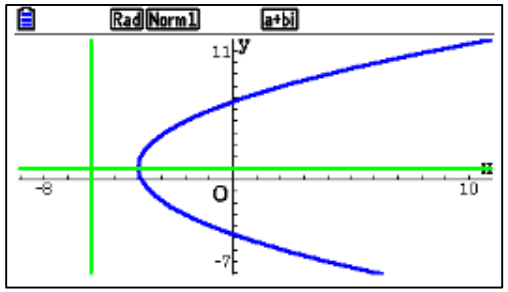
3. To find the focus & vertex F5 F1 F5 F4





4. To find the symmetry & Directrix F5 F2 F5 F3





Example: Find focus, vertex, symmetry, and DirectX for the following equation:

$$(x-2)^2 = 4(y-5)$$

a. Write the equation as the calculator's formula

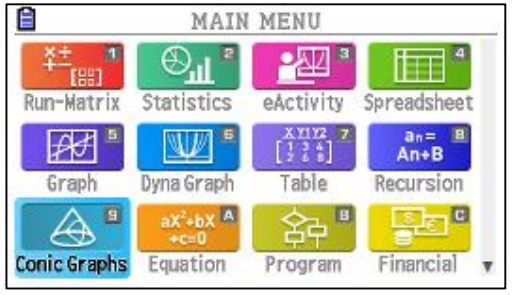
$$y = \frac{1}{4}(x-2)^2 + 5$$

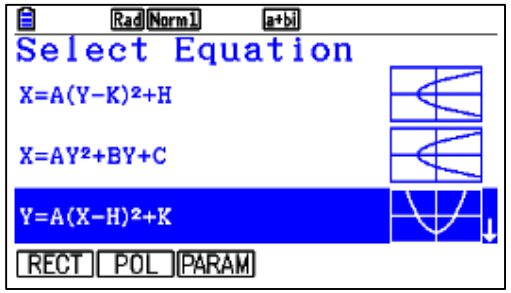
b. Find the required values from the equation as below

$$A = \frac{1}{4}, K = 5, H = 2$$

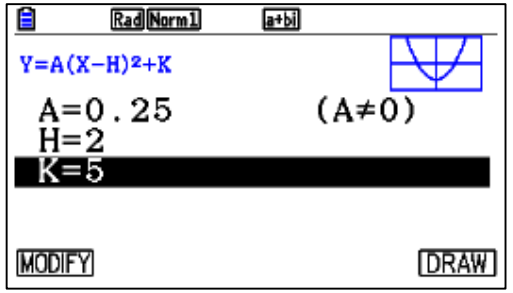
c. By using CASIO fx-CG50 Calculator:

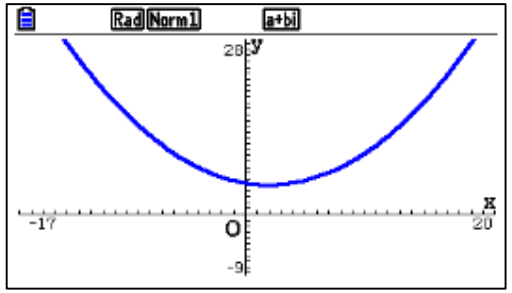
1. Go to Conics and select the formula MENU 9 ▼ ▼ EXE



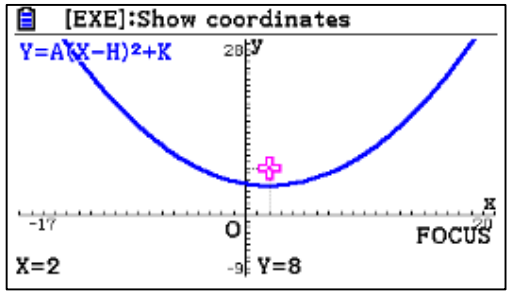


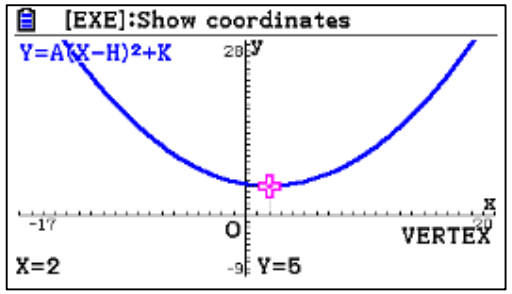
2. Fill the data and draw the graph 1 ▤ 1 2 EXE 2 EXE 5 EXE F6



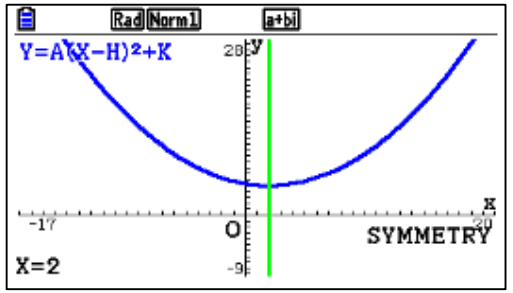


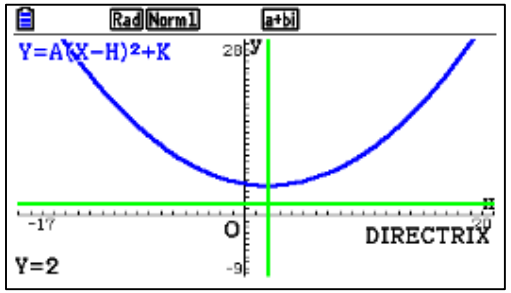
3. To find the focus & vertex F5 F1 F5 F4





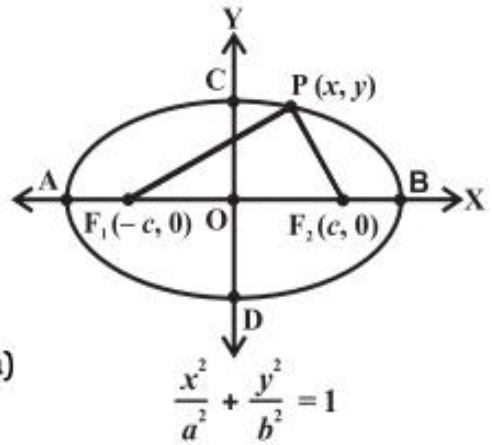
4. To find the symmetry & DirectX F5 F2 F5 F3





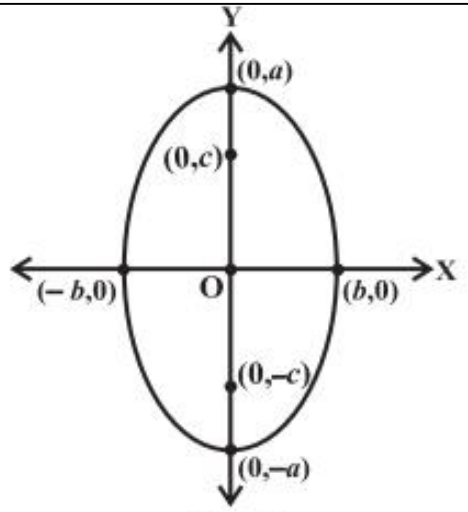
Ellipse

an ellipse is a plane curve surrounding two focal points, such that for all points on the curve, the sum of the two distances to the focal points is a constant



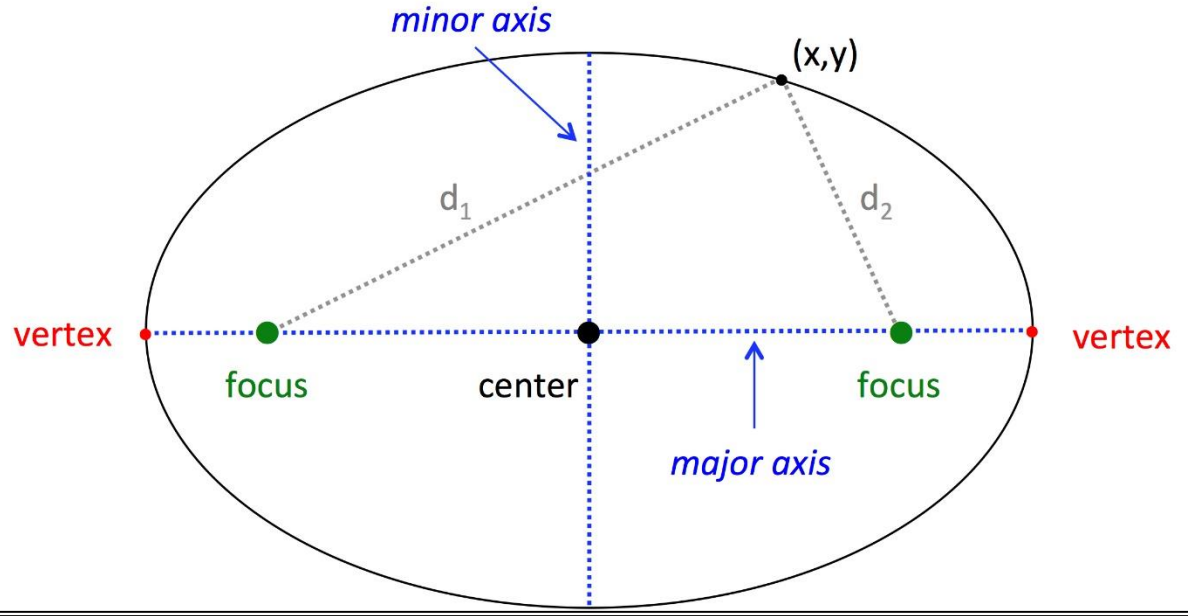
(a)

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$



(b)

$$\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$$



Example: Find focuses, vertices, center, and eccentricity for the following equation:

$$\frac{(x-1)^2}{25}+\frac{(y+2)^2}{16}=1$$

Find the required values from the equation as below

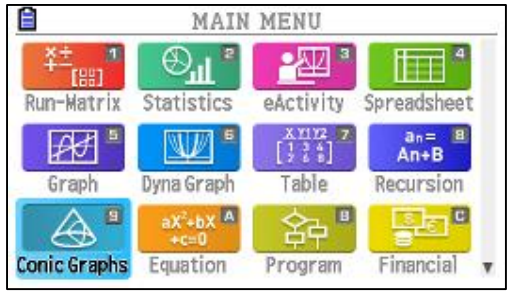
$$A=5\,,B=4\,,H=1\,,K=-2$$

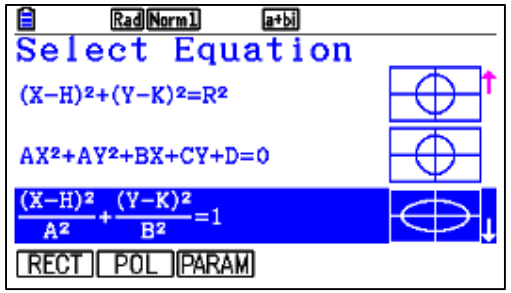
By using CASIO fx-CG50 Calculator:

To draw the ellipse

1. Go to conics and select ellipse

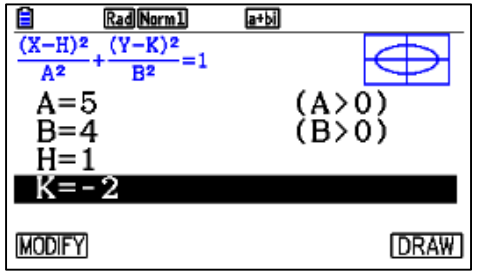
MENU 9 ▼ ▼ ▼ ▼ ▼ ▼ EXE

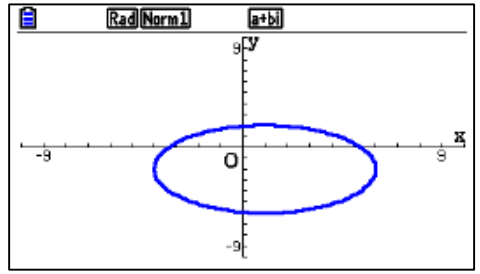




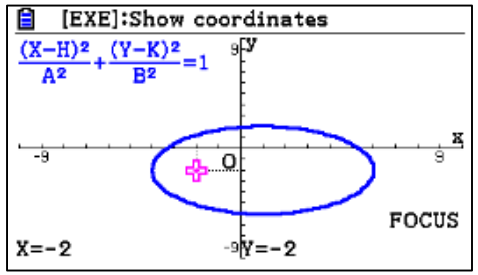
2. Fill the data and draw the graph

5 EXE 4 EXE 1 EXE − 2 EXE F6 F3 F3 EXIT F6

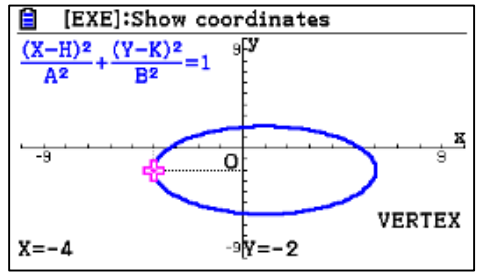




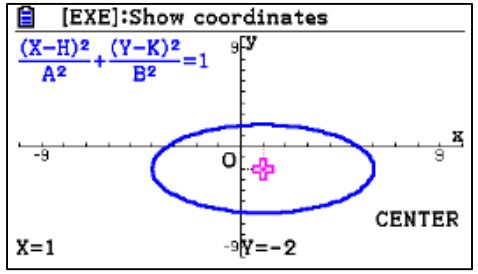
To find the focuses F5 F1 ◀



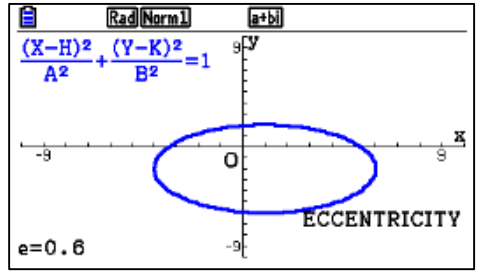
To find the vertices F5 F4 ◀ ◀



To find the center F5 F5



To find the eccentricity F5 F6 F1



Example: Find focuses, vertices, center, and eccentricity for the following equation:

$$\frac{(x+3)^2}{9}+\frac{(y-1)^2}{16}=1$$

Find the required values from the equation as below

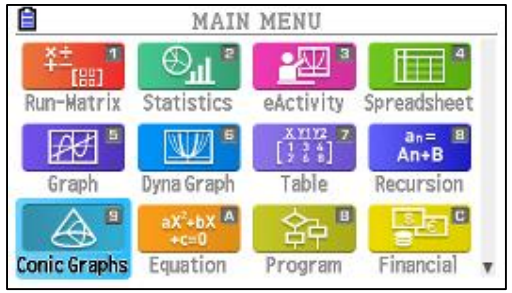
$$A=3\,,B=4\,,H=-3\,,K=1$$

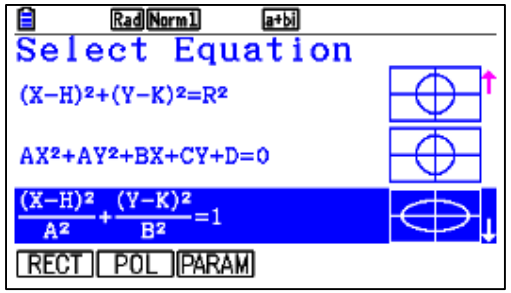
By using CASIO fx-CG50 Calculator:

To draw the ellipse

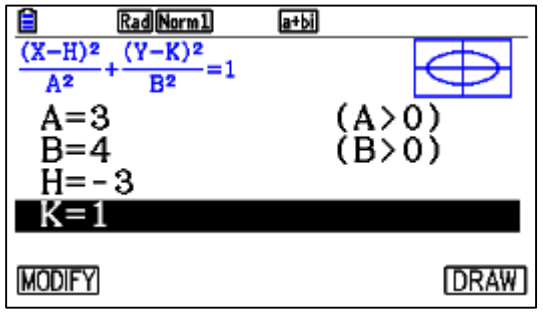
1. Go to conics and select ellipse

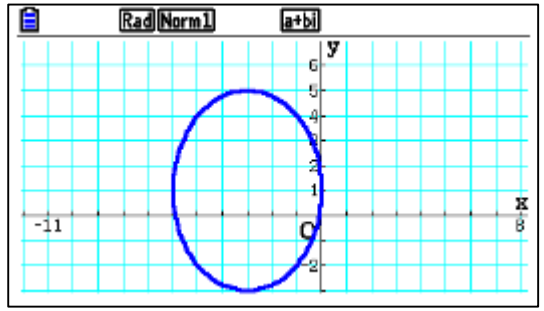
MENU 9 ▼ ▼ ▼ ▼ ▼ ▼ EXE



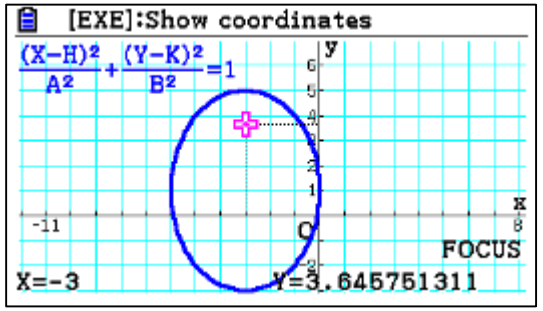


2. Fill the data and draw the graph 3 EXE 4 EXE (−) 3 EXE 1 EXE F6

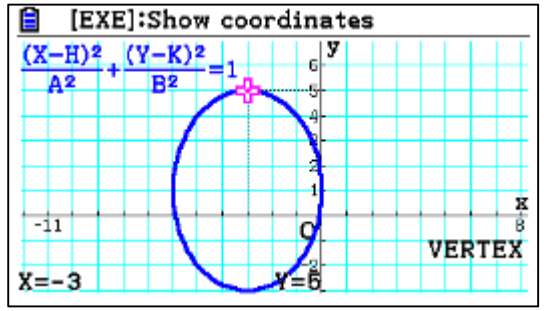




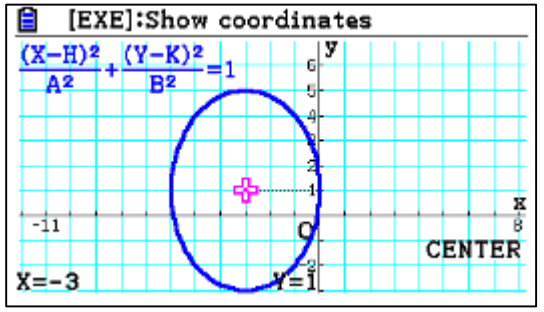
To find the focuses F5 F1



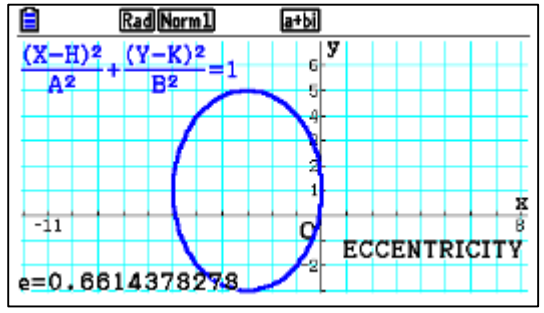
To find the vertices F5 F4 ▲



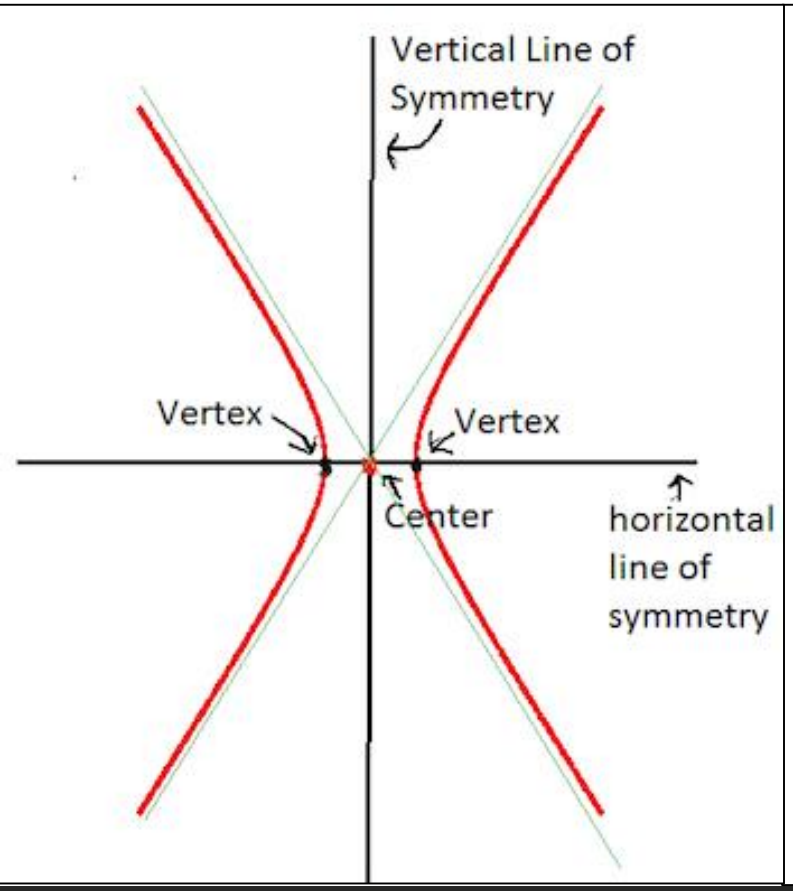
To find the center F5 F5

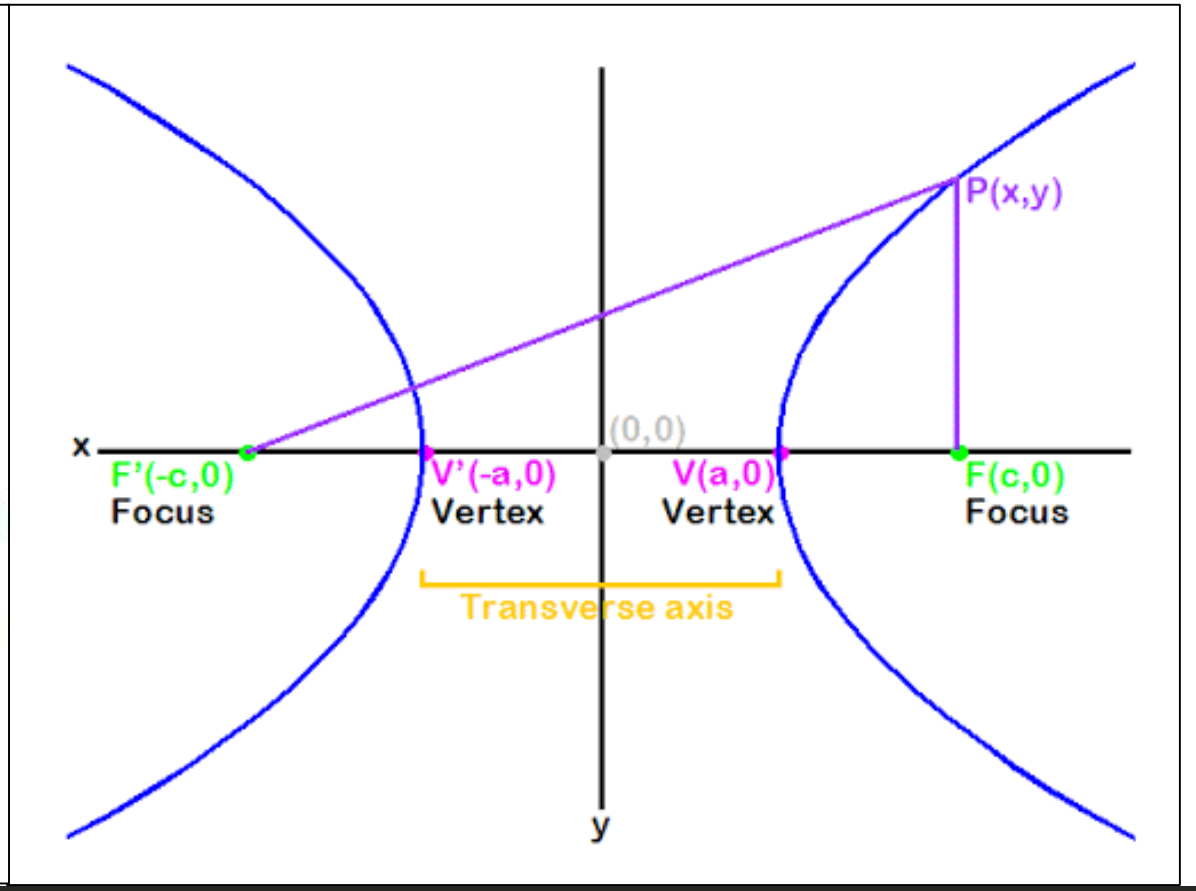


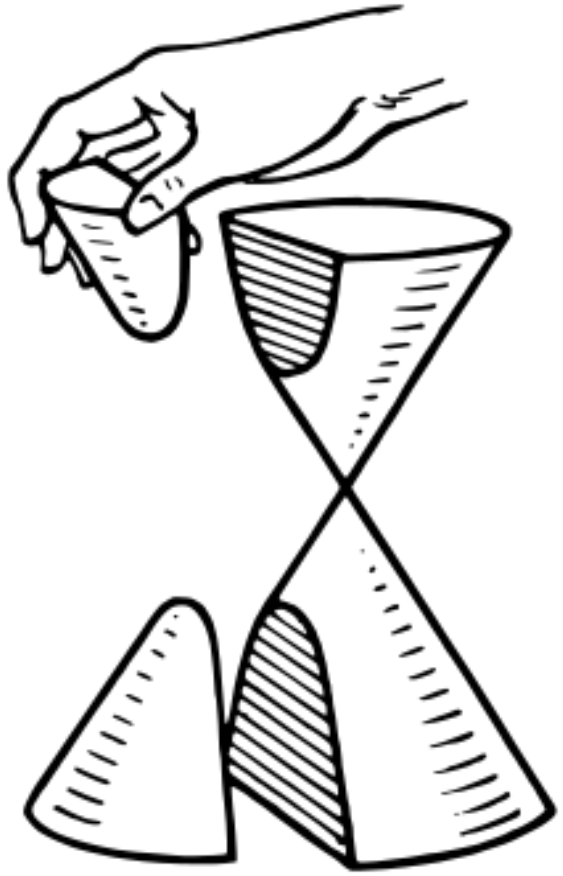
To find the eccentricity F5 F6 F1



A **hyperbola** is an open curve with two branches, the intersection of a plane with both halves of a double cone. The plane does not have to be parallel to the axis of the cone; the **hyperbola** will be symmetrical in any case.







Example: Find focuses, vertices, center, and eccentricity for the following equation:

$$\frac{(x+3)^2}{16}+\frac{(y-2)^2}{9}=1$$

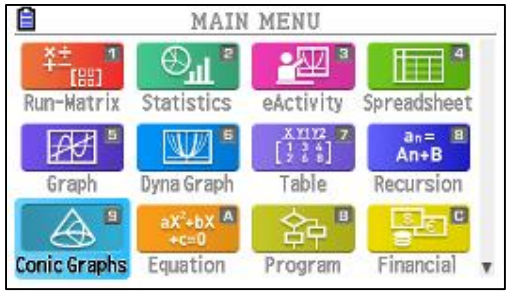
Find the required values from the equation as below

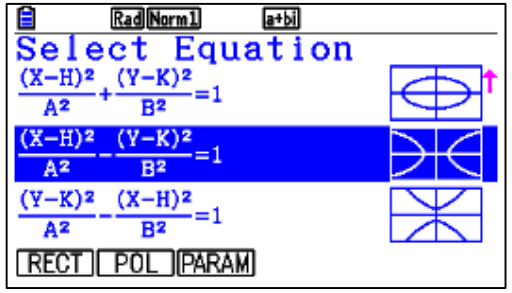
$$A=4\,,B=3\,,H=-3\,,K=2$$

By using CASIO fx-CG50 Calculator:

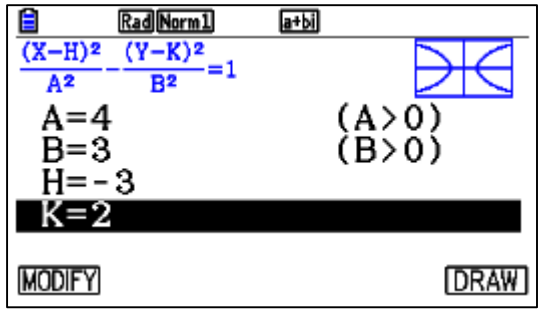
To draw the Hyperbola

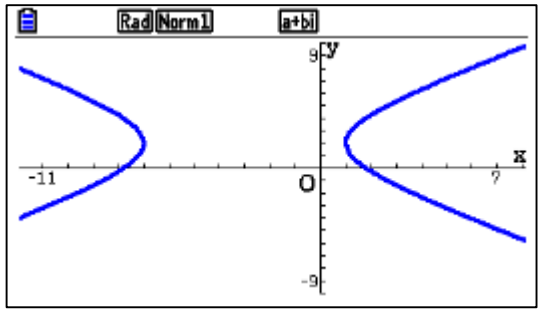
1. Go to conics and select ellipse MENU 9 ▲ ▲



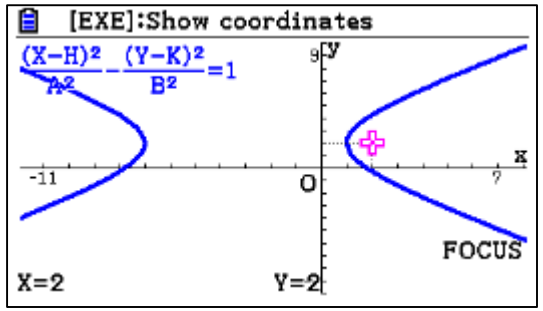


2. Fill the data and draw the graph 4 EXE 3 EXE (−) 3 EXE 2 EXE F6

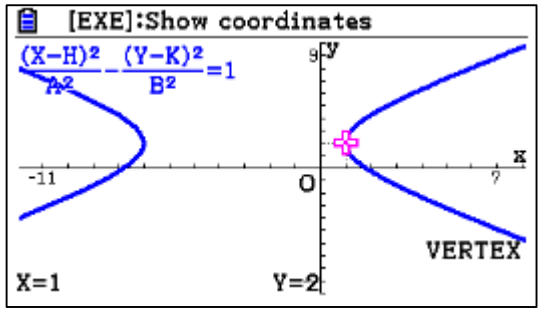




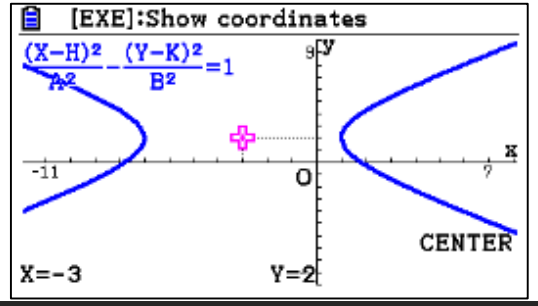
To find the focuses F5 F1



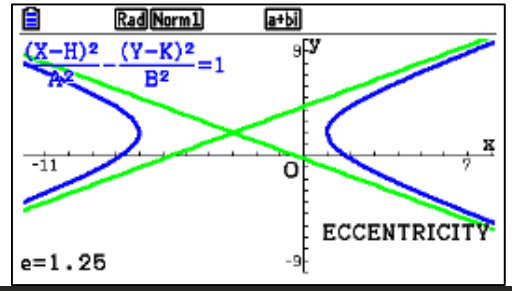
To find the vertices F5 F4



To find the center F5 F6 F1



To find the asymptotes & eccentricity F5 F5 F5 F6 F2



Example: Find focuses, vertices, center, and eccentricity for the following equation:

$$\frac{(x-1)^2}{16}+\frac{(y+3)^2}{36}=1$$

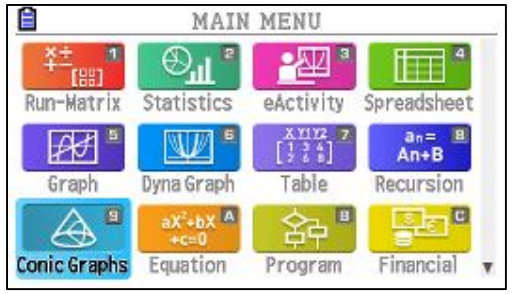
Find the required values from the equation as below

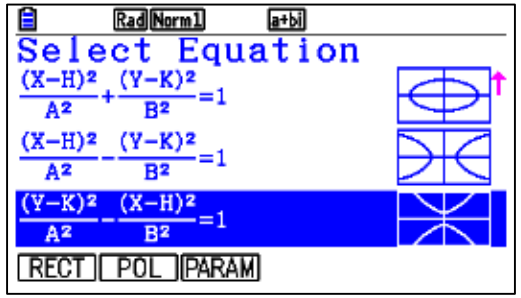
$$A=4\,,B=6\,,H=1\,,K=-3$$

By using CASIO fx-CG50 Calculator:

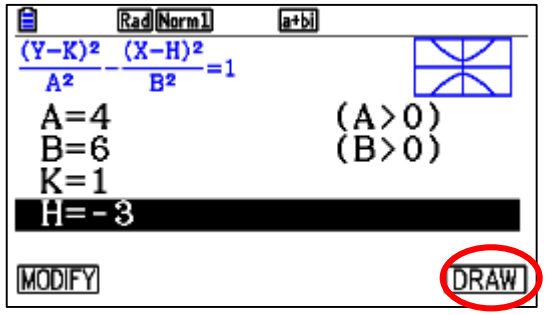
To draw the Hyperbola

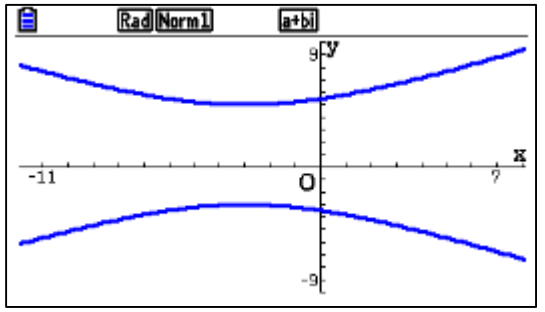
1. Go to conics and select ellipse MENU 9 ▲ ▲



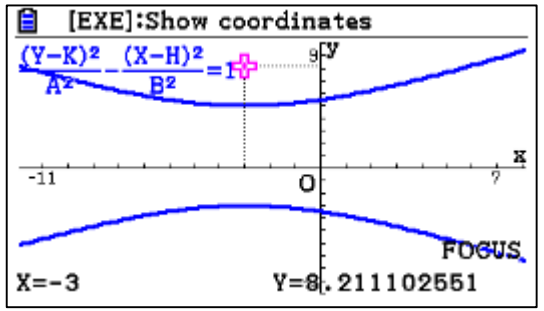


2. Fill the data and draw the graph 4 EXE 6 EXE 1 EXE − 3 EXE F6

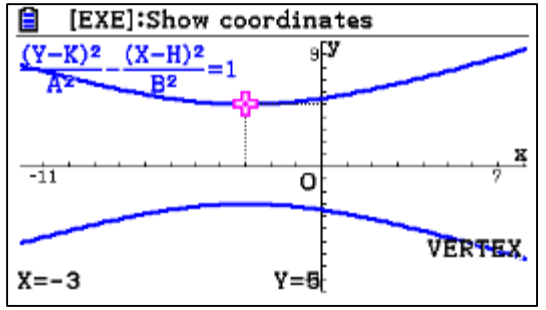




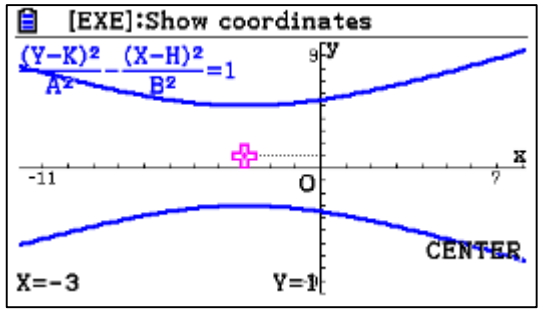
To find the focuses F5 F1



To find the vertices F5 F4

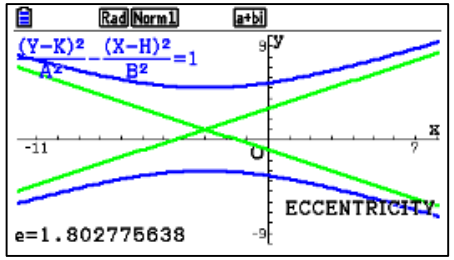


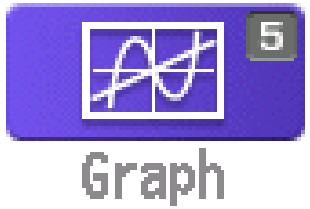
To find the center F5 F6 F1



To find the asymptotes & eccentricity

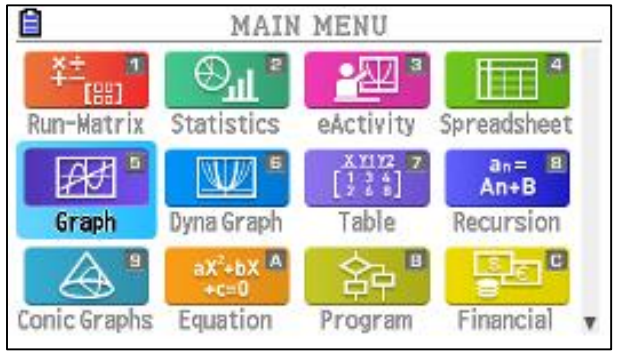
F5 F5 F5 F6 F2

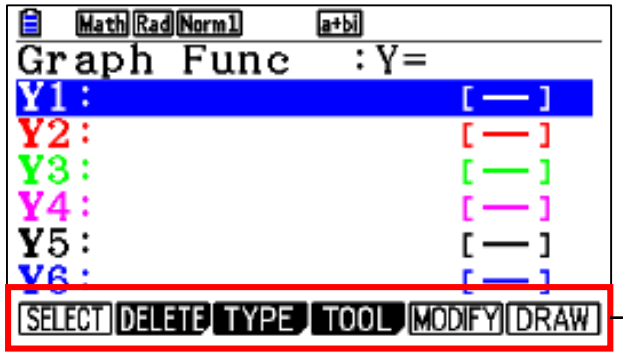




- *Drawing different types of functions (Y=, X= , parametric, Polar, Inequalities).*
- *Sketching (inverse, tangent, norm).*
- *Solving (Roots, Intercepts, y-value, x-value, area, min, max)*

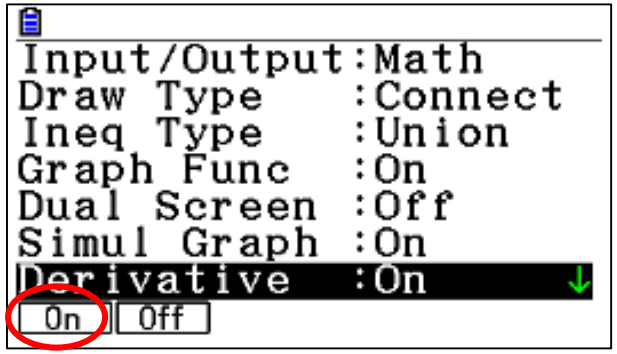
To select graph mode : MENU 5

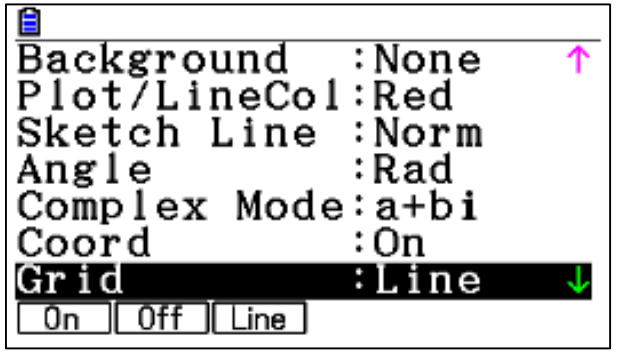




Select	select or unselect functions for drawing
Delete	Delete functions
Type	Select types of functions (polar, parametric, Y= ..)
Tool	Select the style of graph lines
Modify	Explore how the graph changes for different value of A
Draw	To draw the selected functions

Graph setup: SHIFT MENU

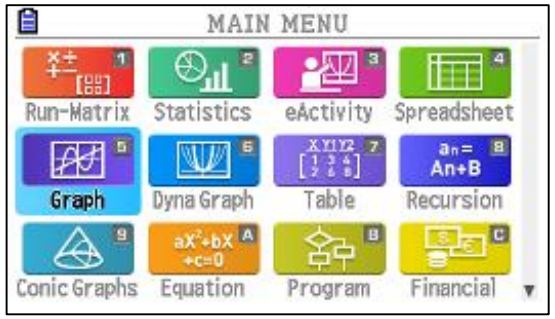


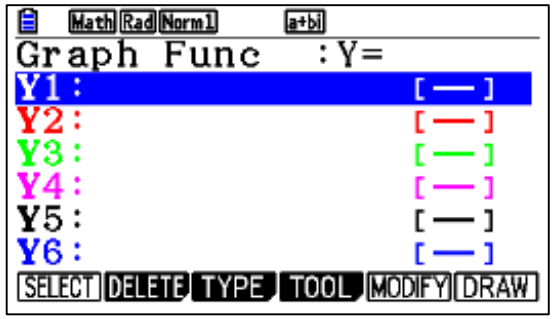


Example: Draw the following function.

$$y = f(x) = 3x + 1$$

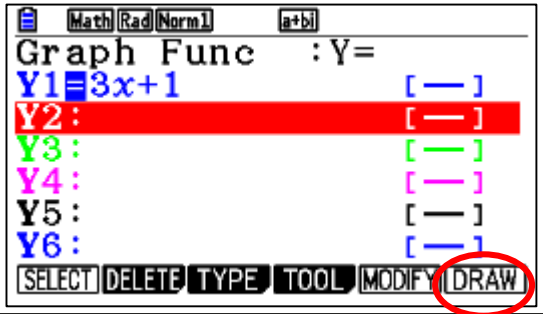
1. Got to graph mode MENU 5



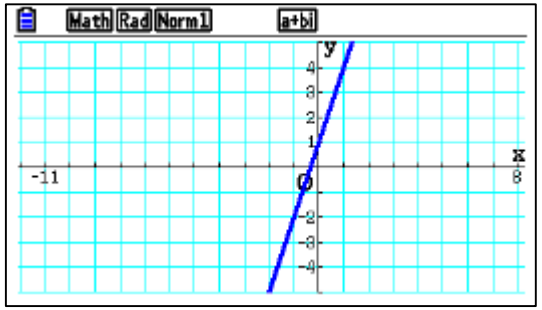


2. Select the type (Y=) and write the functions

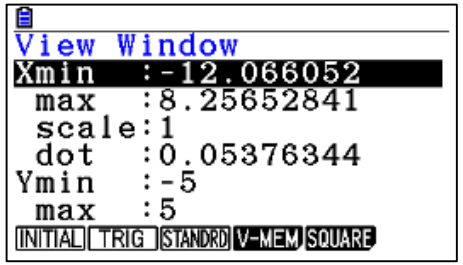
F3 F1 3 X,θ,T + 1 EXE

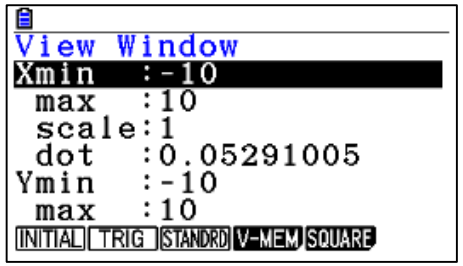


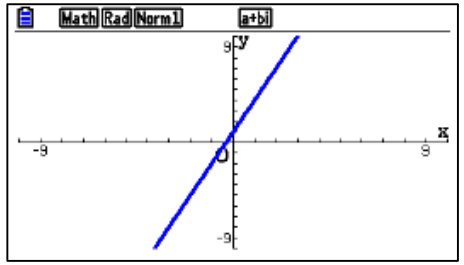
3. To see the graph press F6



4. To modify the V-windows F3 F3 EXIT F6



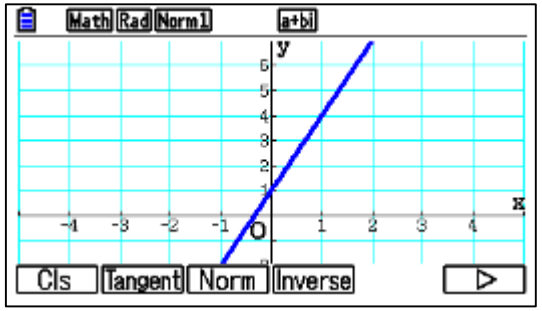




- You can choose any scale for the axis or from the exist options (Initial, Trig, Standard).
- Use the arrows and + \ - for zoom in\out.

5. To sketch the function again as it is without any extras (tangent line or inverse):

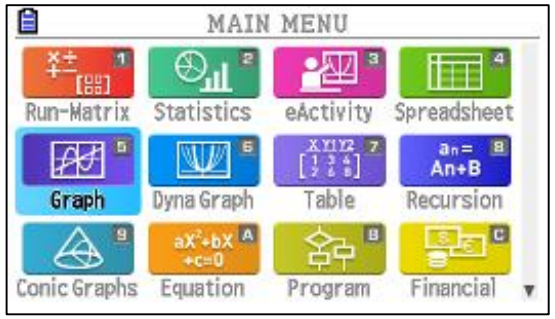
F4 F1

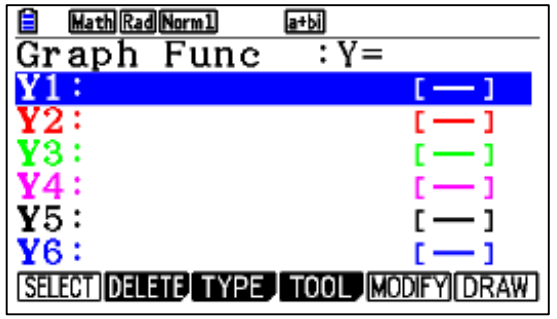


Example: Draw the following function and use modify to se the graph types.

$$y = f(x) = Ax + 1$$

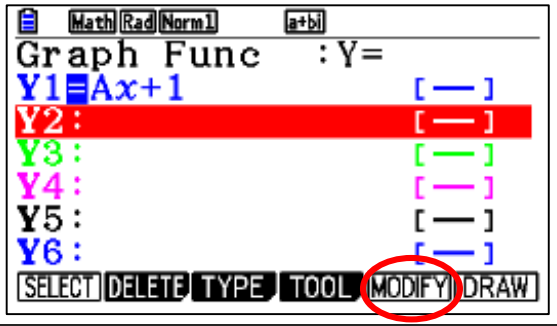
1. Got to graph mode MENU 5



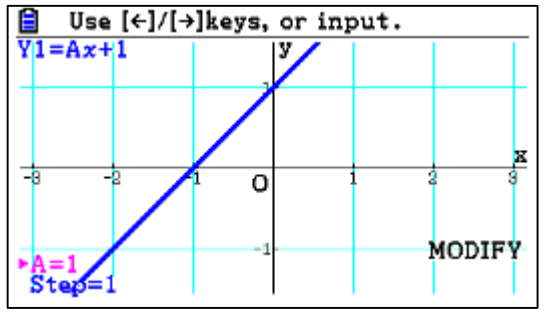


2. Select the type (Y=) and write the functions

ALPHA X,θ,T X,θ,T + 1 EXE

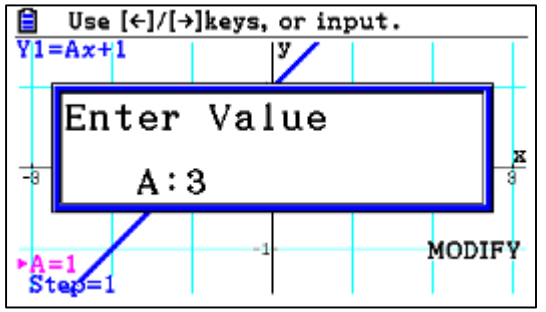


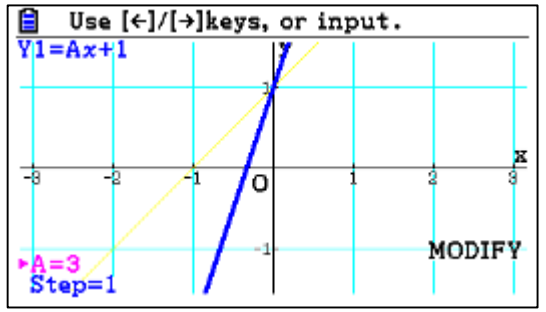
3. To see the graph press F5



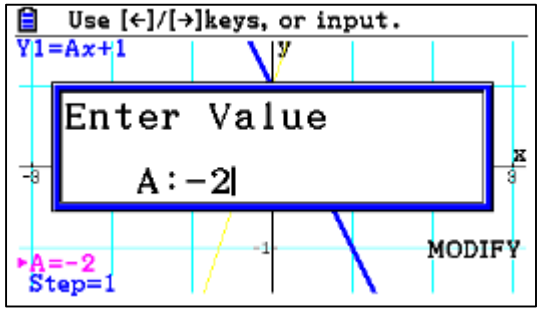
Enter any value for A to see the graph changes

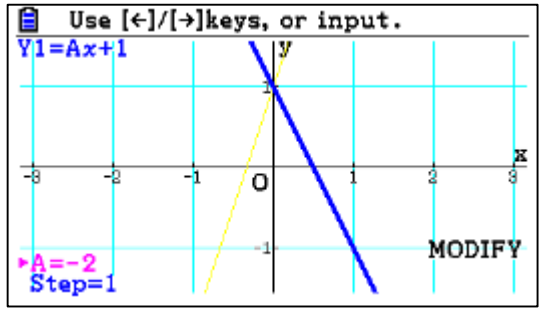
3 EXE





− 2 EXE



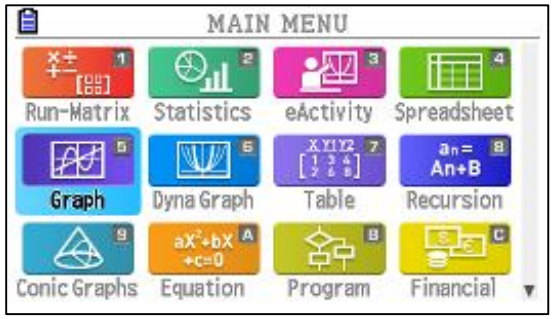


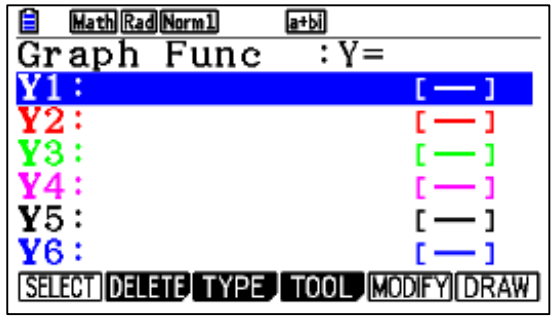
Example:

1. Draw the following function.
2. Sketch the inverse, tangent line, and norm at x=2.

$$y = f(x) = (x-3)(2x-1)$$

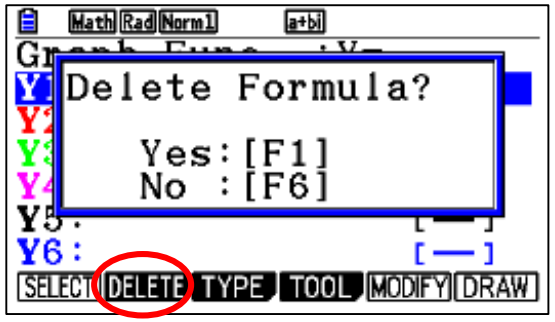
1. Got to graph mode MENU 5





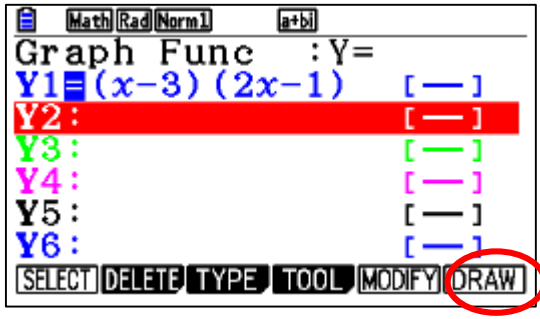
2. Delete the previous function

F2 F1



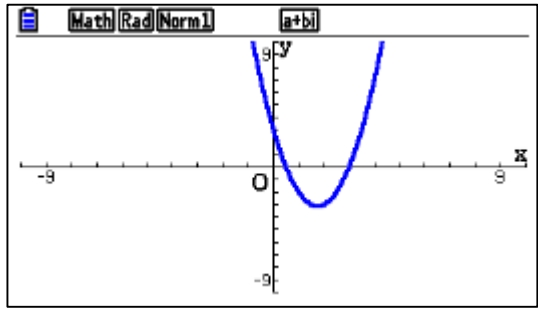
2. Make sure the type (Y=) and write the function.

(X,θ,T − 3) (2 X,θ,T − 1) EXE



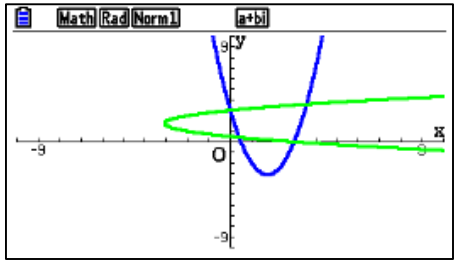
3. To see the graph press F6

Modify the V-window if required:



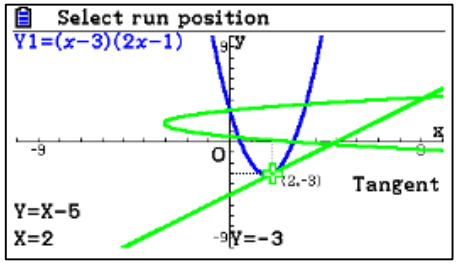
4. To sketch the inverse , Tangent line and the norm:

F4 F4



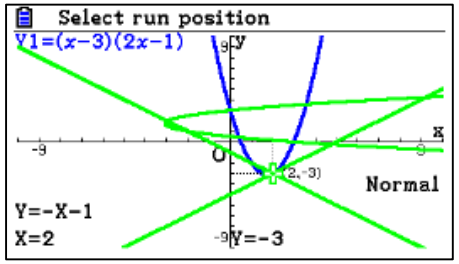
Inverse

F4 F2 2 EXE EXE



Tangent at x=2

F4 F3 2 EXE EXE



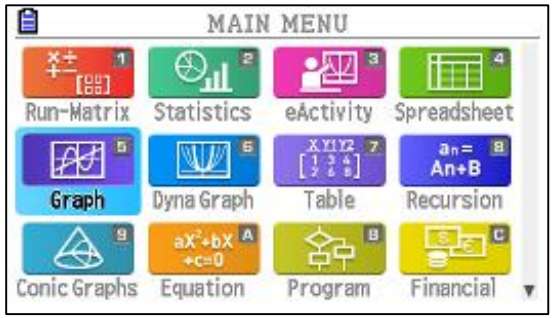
Norm at x=2

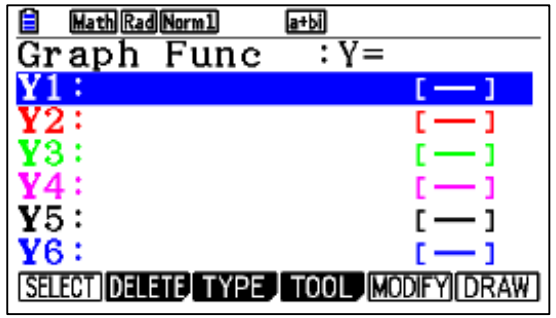
Example:

1. Draw the following function.
2. Sketch the inverse and tangent line at x=-1.

$$y = f(x) = x^3 - 4x + 1$$

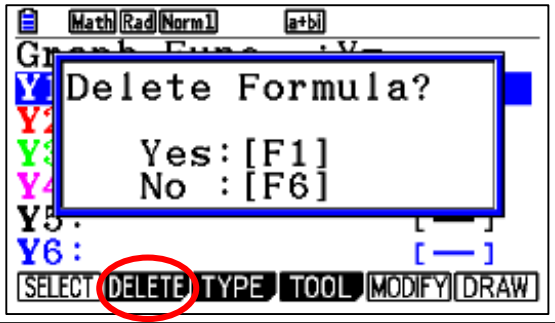
1. Got to graph mode MENU 5





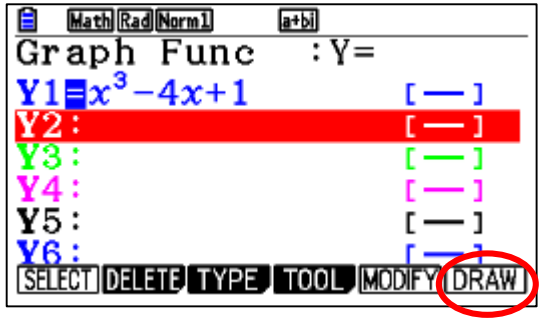
2. Delete the previous function

F2 F1



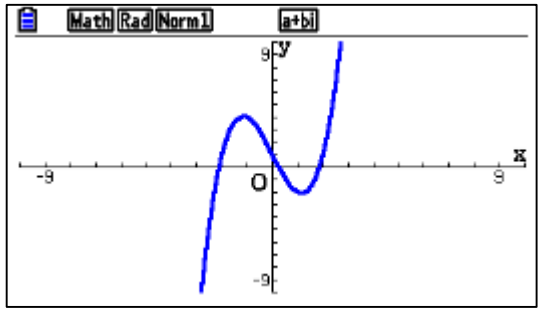
2. Make sure the type (Y=) and write the function.

X,θ,T ^ 3 ▶ − 4 X,θ,T + 1 EXE



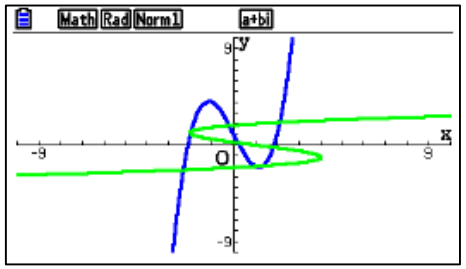
3. To see the graph press F6

Modify the V-window if required:



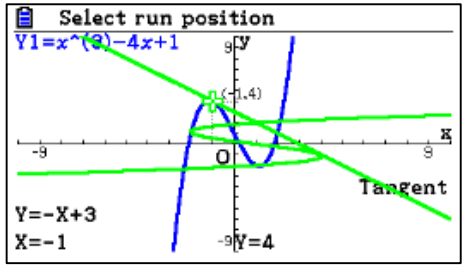
4. To sketch the inverse , Tangent line and the norm:

F4 F4



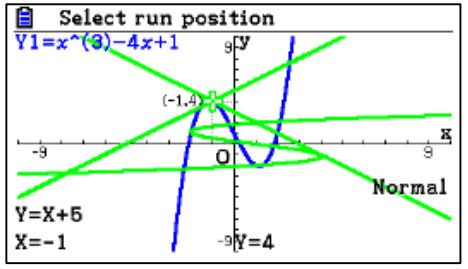
Inverse

F4 F2 − 1 EXE EXE



Tangent at x=-1

F4 F3 − 1 EXE EXE



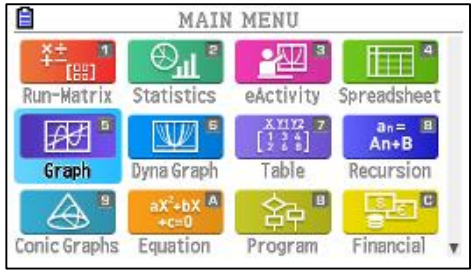
Norm at x=-1

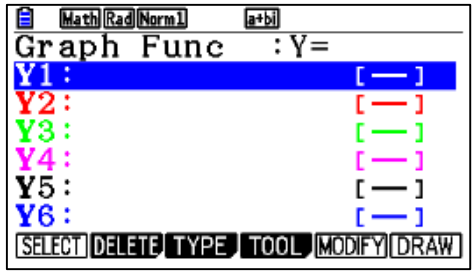
Example:

1. Draw the following function.
2. Sketch the inverse and tangent line at any point.
3. Find the roots , Min ,Max, Area at any two points if possible.

$$y = f(x) = \sqrt{x-1}$$

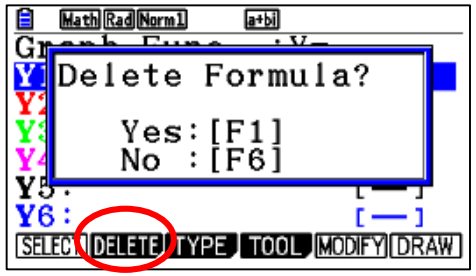
1. Got to graph mode MENU 5



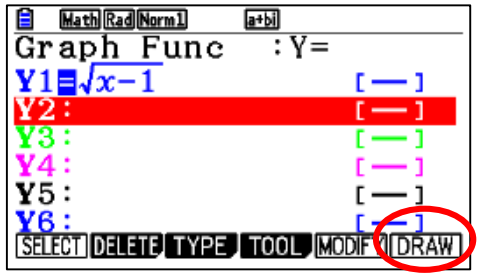


2. Delete the previous function and write the new function.

F2 F1

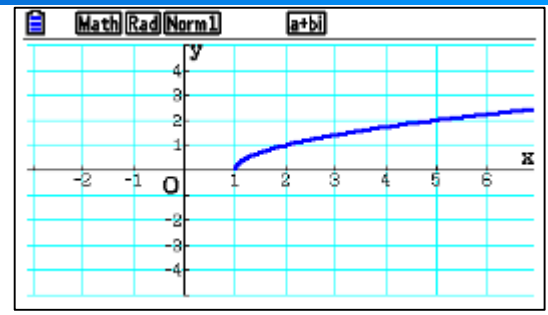


SHIFT x^2 X,θ,T



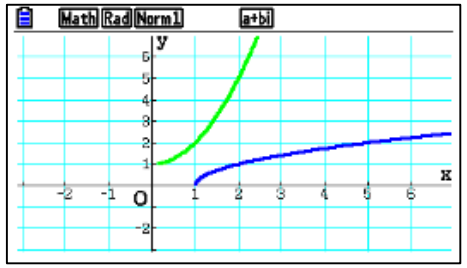
3. To see the graph press F6

Modify the V-window if required:



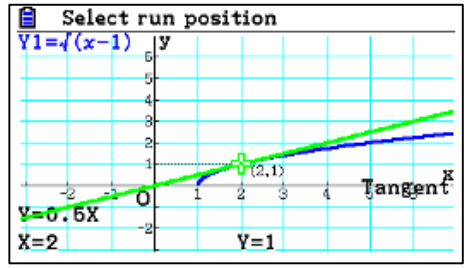
4. To sketch the inverse , Tangent line and the norm:

F4 F4



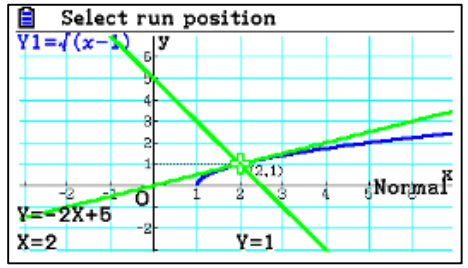
Inverse

F4 F1 F4 F2 2 EXE EXE



Tangent at x=2

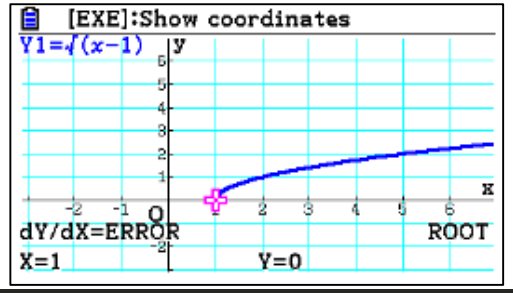
F4 F3 2 EXE EXE



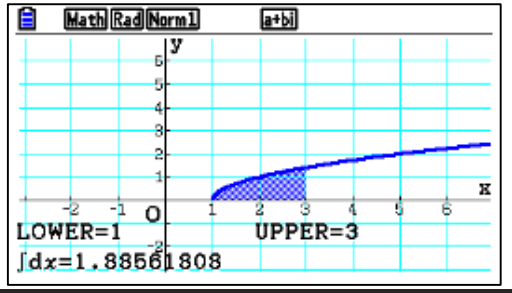
Norm at x=2

5. To find the root and area between [1,3]:

F4 F1 F5 F1



F5 F6 F3 F1 1 EXE EXE 3 EXE

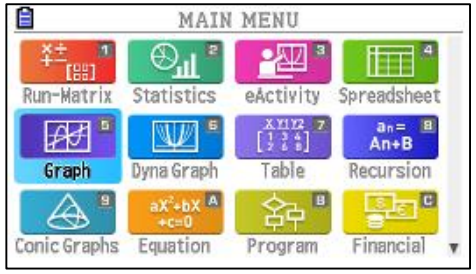


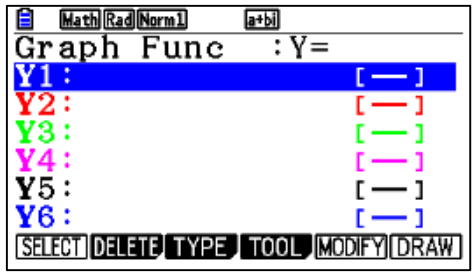
Example:

1. Draw the following function.
2. Sketch the inverse and tangent line at any point.
3. Find the Area.

$$y = f(x) = \sqrt[3]{3x+7}$$

1. Got to graph mode MENU 5

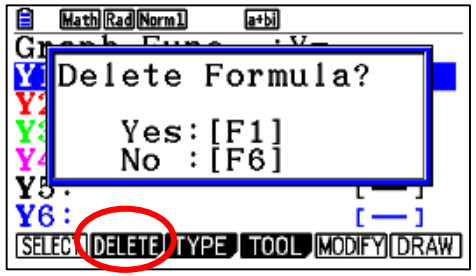


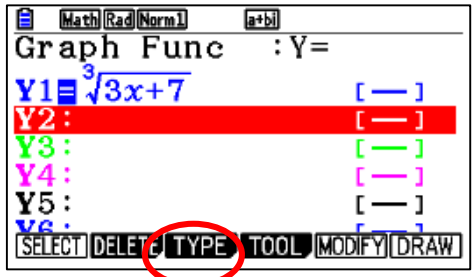


2. Delete the previous function and write the new function.

F2 F1

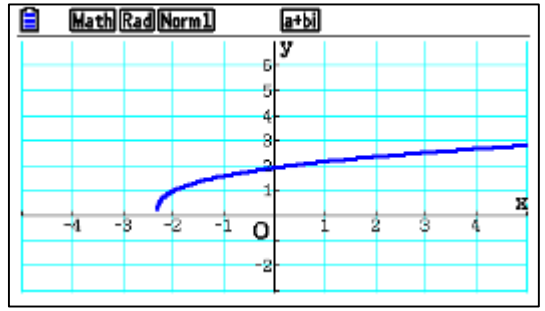
SHIFT ^ 3 ▶ 3 X,θ,T + 7 EXE





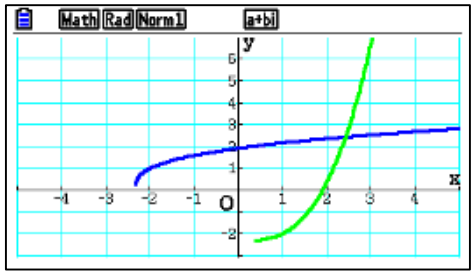
3. To see the graph press F6

Modify the V-window if required:

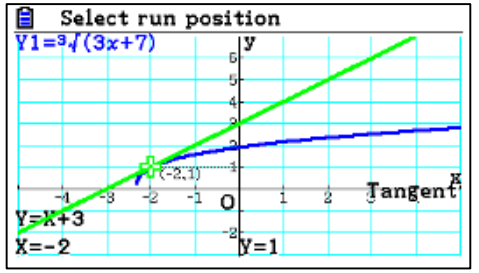


4. To sketch the inverse , Tangent line and the norm:

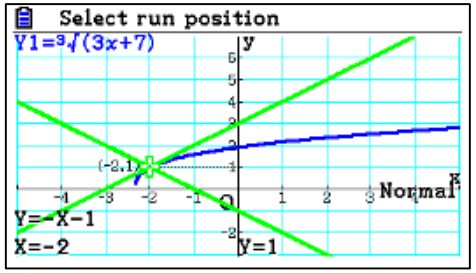
F4 F4 F4 F1 F4 F2 − 2 EXE EXE F4 F3 − 2 EXE EXE



Inverse



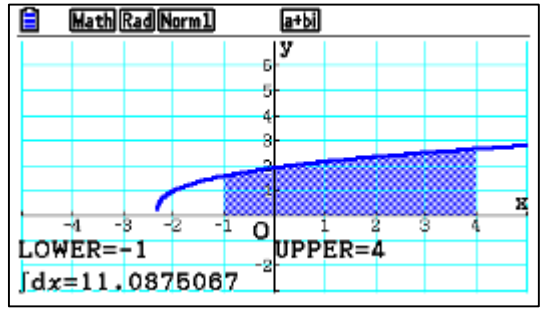
Tangent at x= -2



Norm at x= -2

5. To find the area between [-1,4]:

F4 F1 F5 F6 F3 F1 − 1 EXE EXE 4 EXE

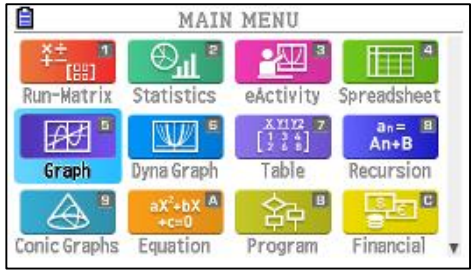


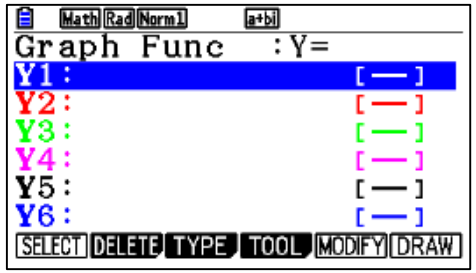
Example:

1. Draw the following function.
2. Sketch the inverse.
3. Find the root, Y-intercept and Area.

$$y = f(x) = |2x - 1|$$

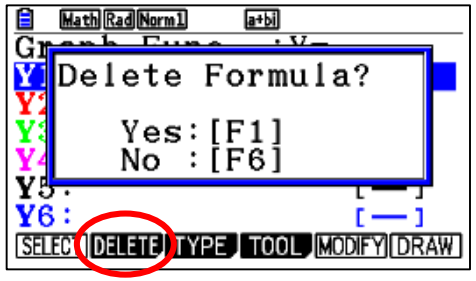
1. Got to graph mode MENU 5



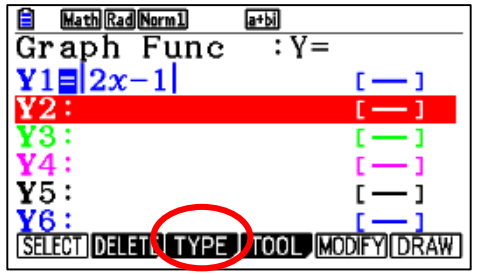


2. Delete the previous function and write the new function.

F2 F1

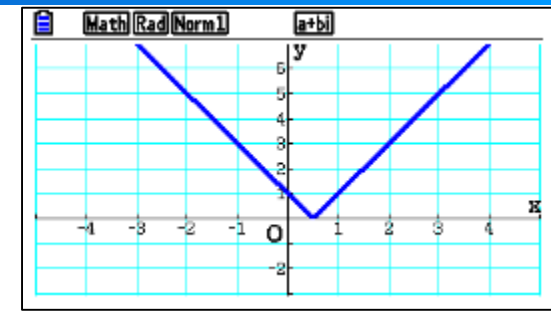


OPTN F5 F1 2 X,θ,T (−) 1 EXE

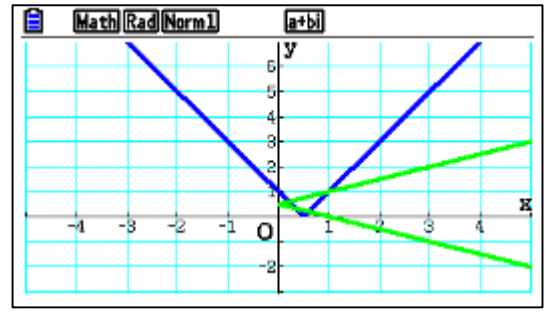


3. To see the graph press F6

Modify the V-window if required:

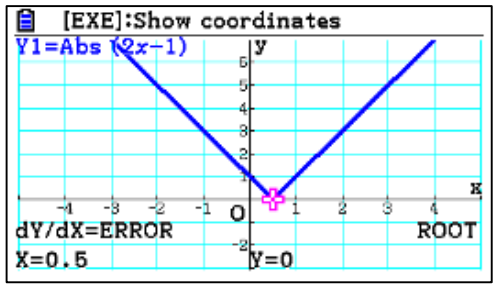


4. To sketch the inverse: F4 F4



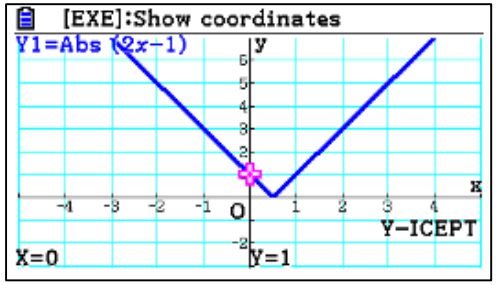
5. To find the root, Y-intercept and area between [-2,2]:

F4 F1 F5 F1



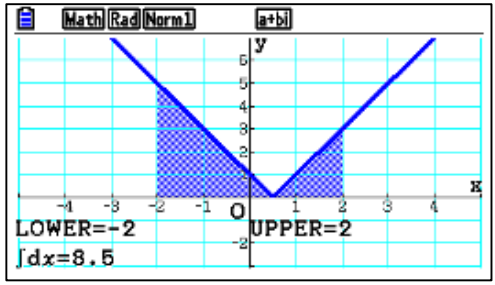
Root

F5 F4



Y- intercept

F5 F6 F3 F1 (−) 2 EXE EXE 2 EXE



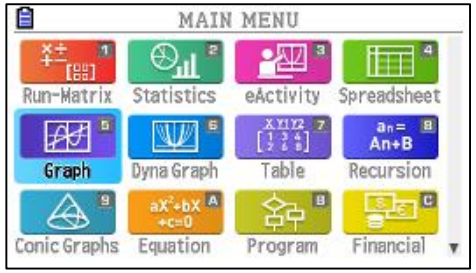
Area

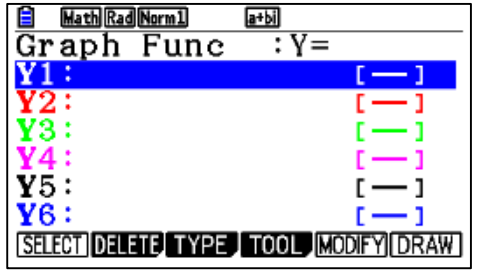
Example:

1. Draw the following function.
2. Sketch the inverse.
3. Find the root and y-Intercept.

$$y = f(x) = \frac{x+1}{2x-5}$$

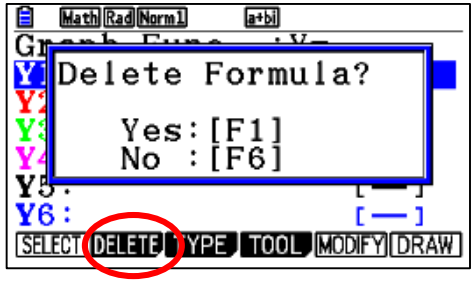
1. Got to graph mode MENU 5

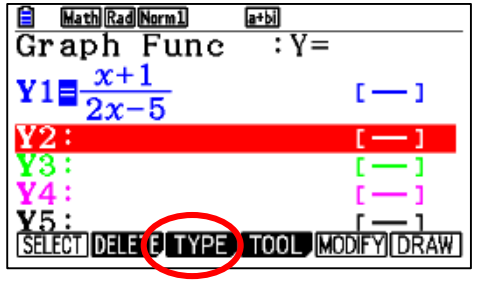




2. Delete the previous function and write the new function.

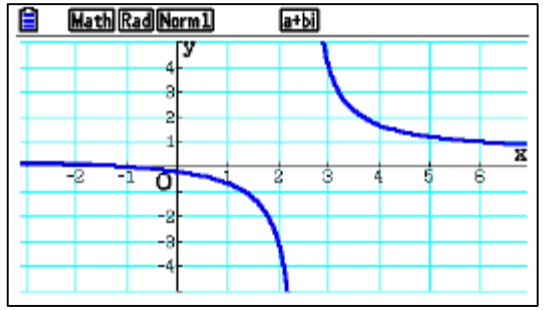
F2 F1 (X,θ,T) + 1 ▶ 2 (X,θ,T) − 5 EXE



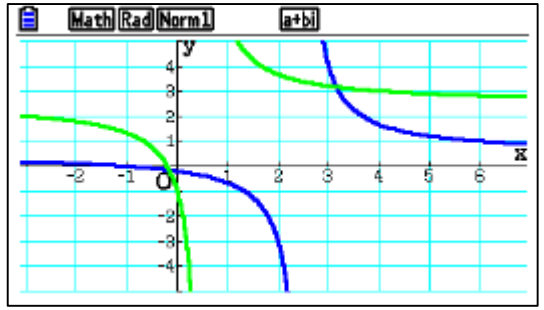


3. To see the graph press F6

Modify the V-window if required:

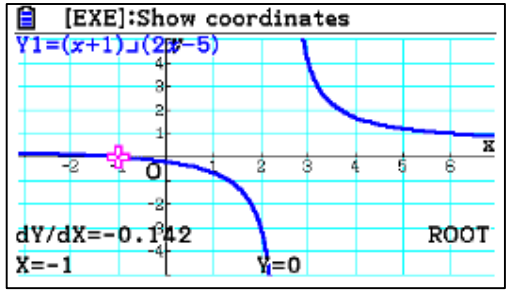


4. To sketch the inverse: F4 F4



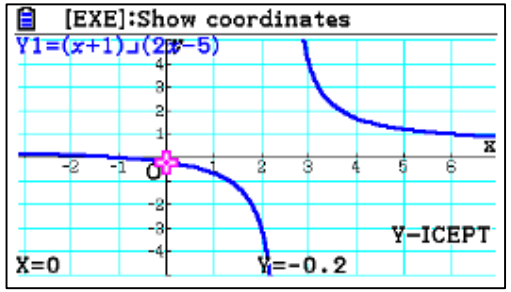
5. To find the root, Y-intercept:

F4 F1 F5 F1



Root

F5 F4



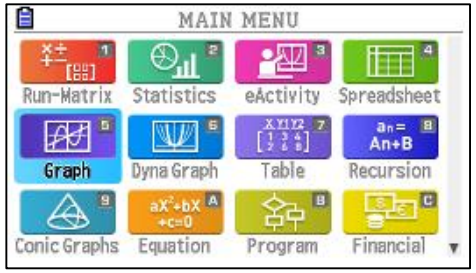
Y- intercept

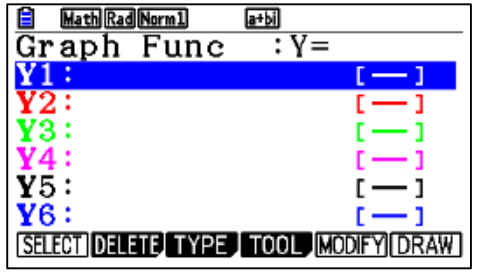
Example:

1. Draw the following function.
2. Sketch the inverse.
3. Find the roots.

$$y = f(x) = \log x^2 - 1$$

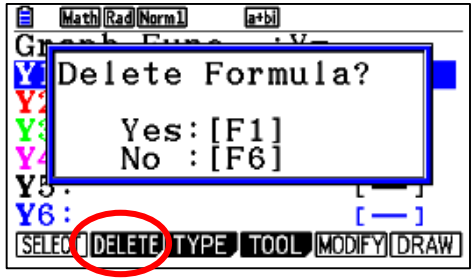
1. Got to graph mode MENU 5



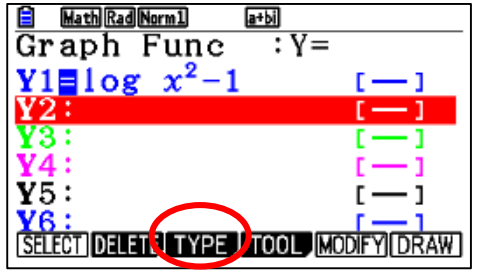


2. Delete the previous function and write the new function.

F2 F1

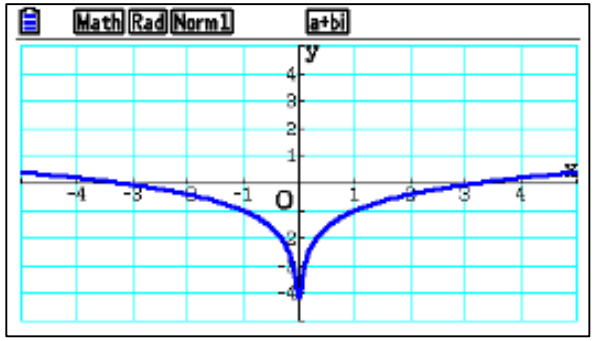


log X,θ,T x^2 (−) 1 EXE EXE

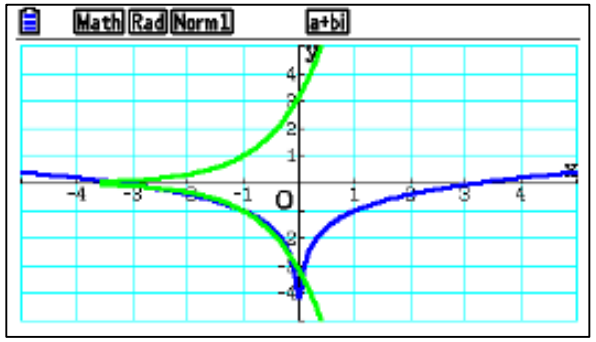


3. To see the graph press F6

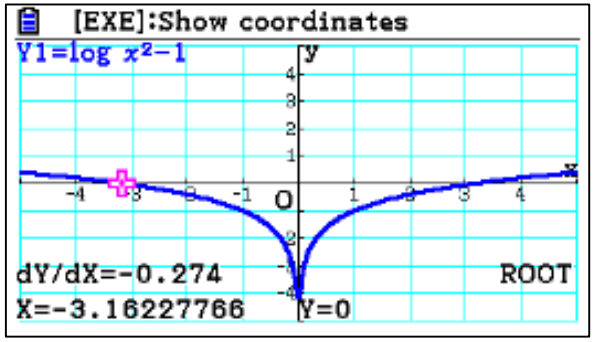
Modify the V-window if required:

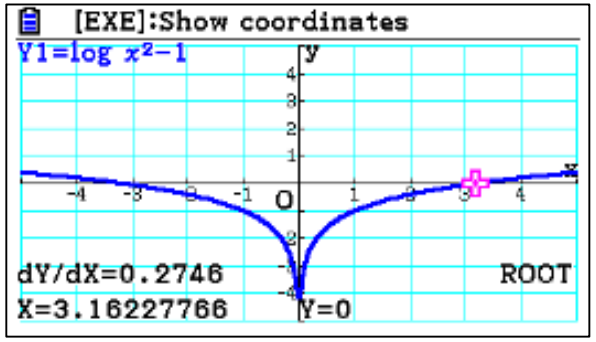


4. To sketch the inverse: F4 F4



5. To find the roots: F4 F1 F5 F1



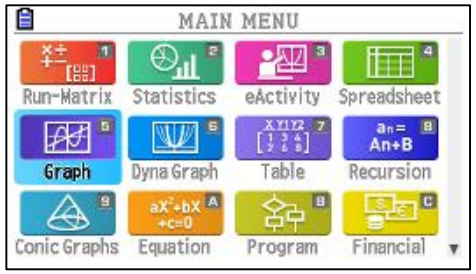


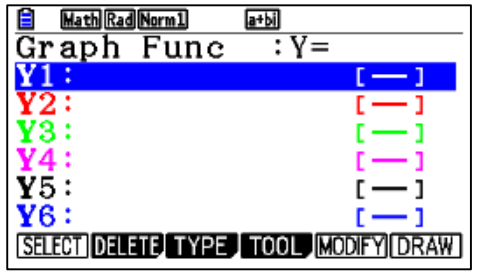
Example:

1. Draw the following function.
2. Sketch the inverse.
3. Find the roots.

$$y = f(x) = \sin x + \cos 2x$$

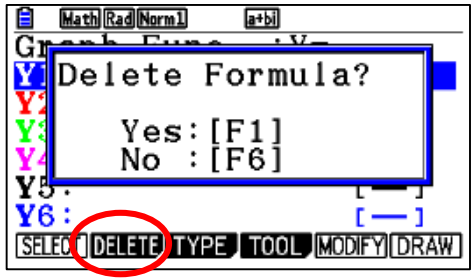
1. Got to graph mode MENU 5

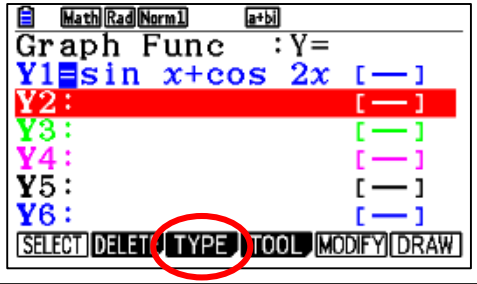




2. Delete the previous function and write the new function.

F2 F1 sin X,θ,T + cos 2 X,θ,T EXE

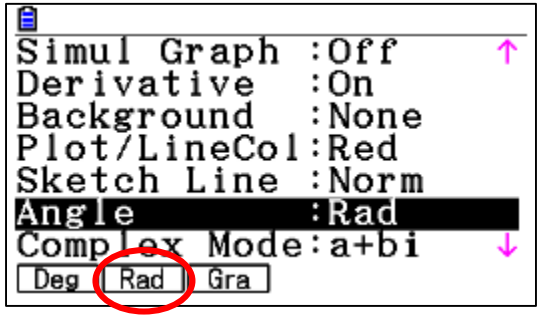


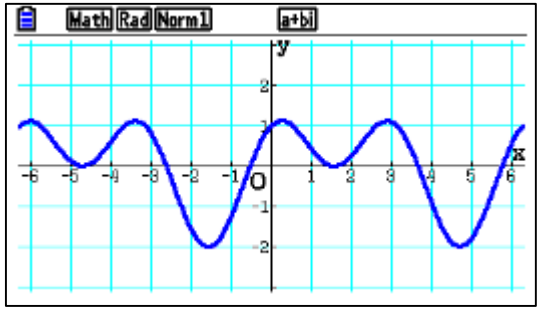


3. To see the graph press F6

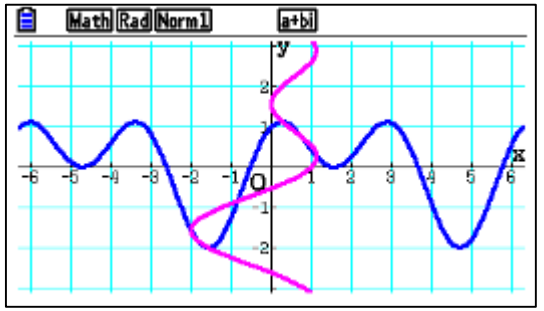
Make sure that the Angle unit is RAD SHIFT MENU

Modify the V-window if required:

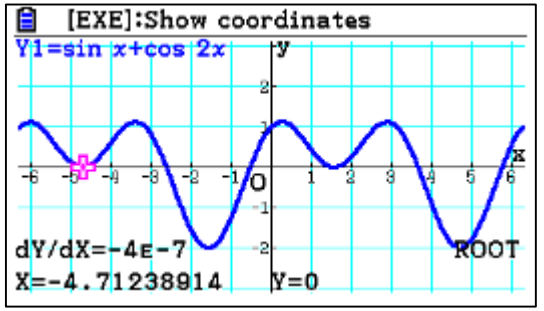




4. To sketch the inverse: F4 F4



5. To find the roots: F4 F1 F5 F1

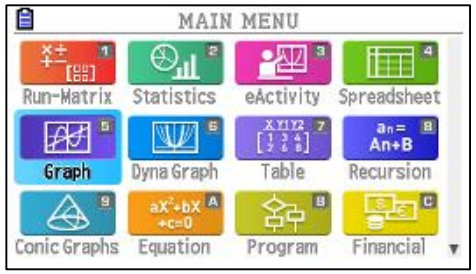


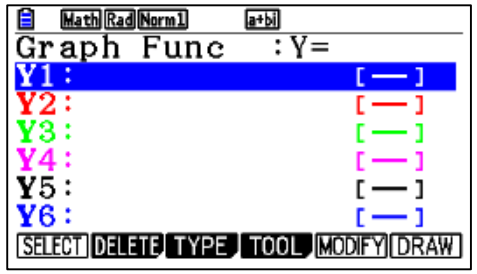
Example:

1. Draw the following function.
2. Sketch the inverse.
3. Find the roots.

$$y = f(x) = \tan^{-1} 3x$$

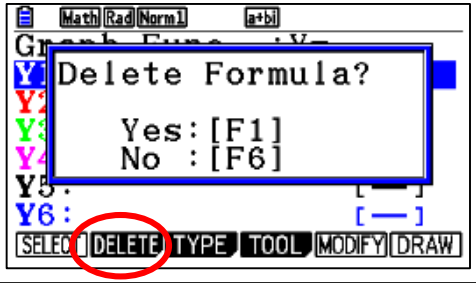
1. Got to graph mode MENU 5

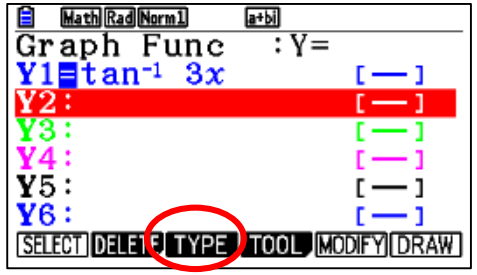




2. Delete the previous function and write the new function.

F2 F1 SHIFT tan 3 X,θ,T EXE

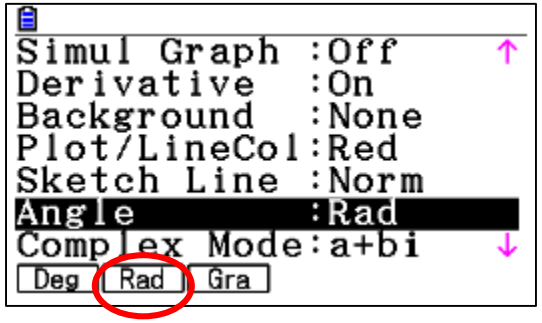


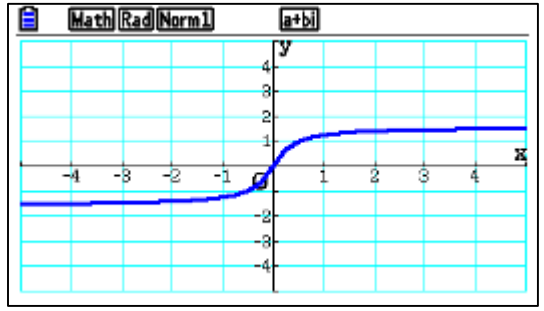


3. To see the graph press F6

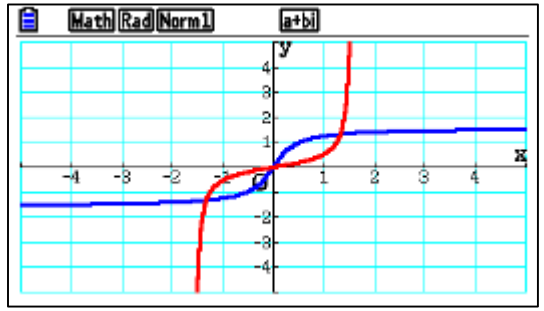
Make sure that the Angle unit is RAD SHIFT MENU

Modify the V-window if required:

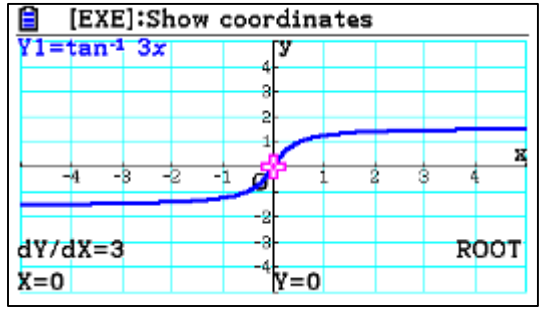




4. To sketch the inverse: F4 F4



5. To find the roots: F4 F1 F5 F1

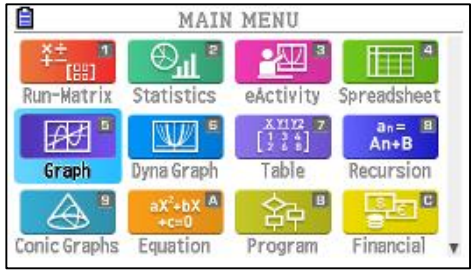


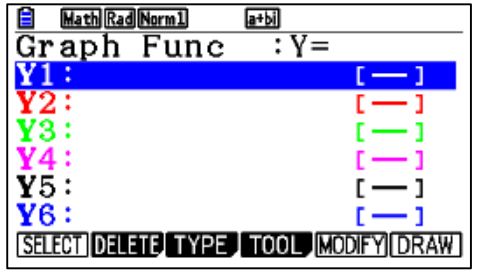
Example:

1. Draw the following piecewise function.
2. Find the area between intersections.

$$Y=\begin{cases} x^2-1 \\ 4-2x^2 \end{cases}$$

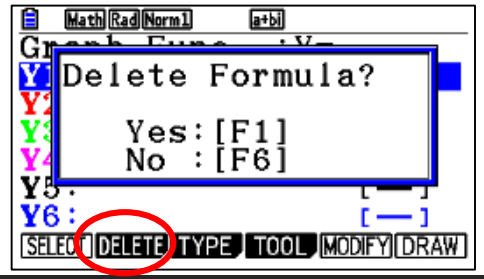
1. Got to graph mode MENU 5



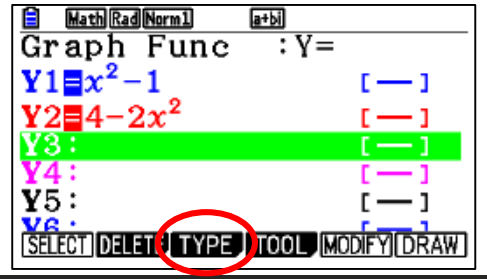


2. Delete the previous function and write the new function.

F2 F1

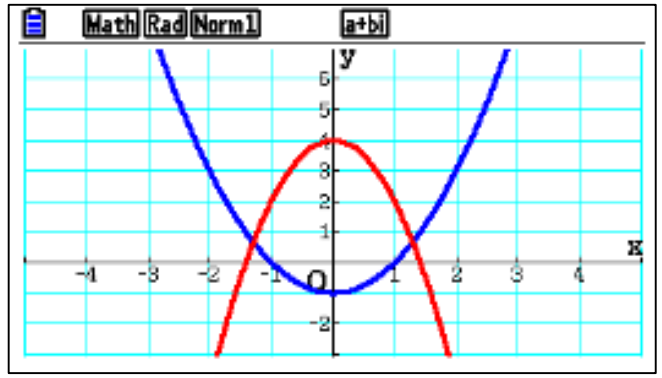


X,θ,T x^2 − 1 EXE 4 − 2 X,θ,T x^2 EXE

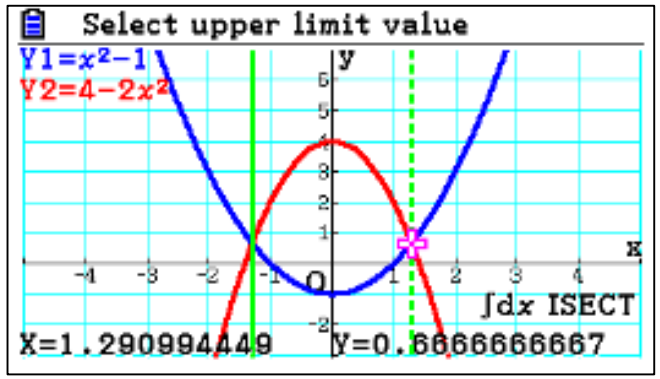


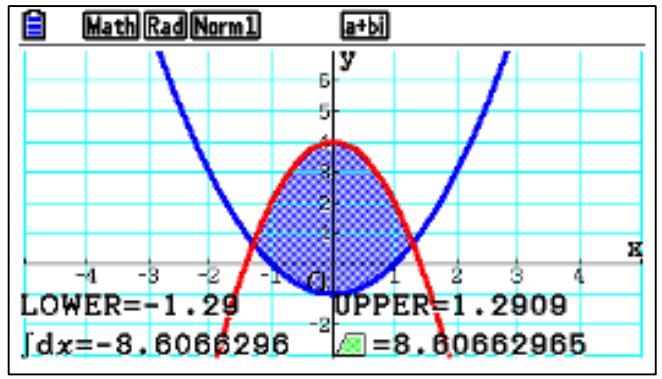
3. To see the graph press F6

Modify the V-window if required:



4. To find the area: F5 F6 F3 F3 EXE ▶ EXE



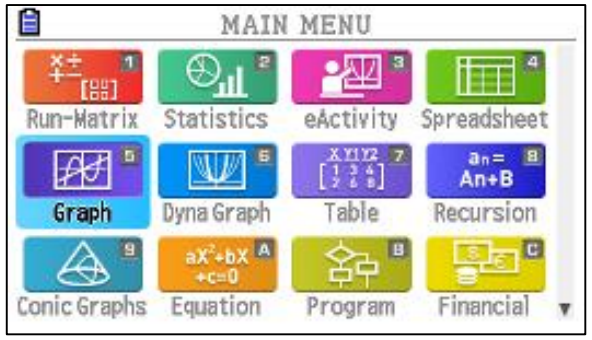


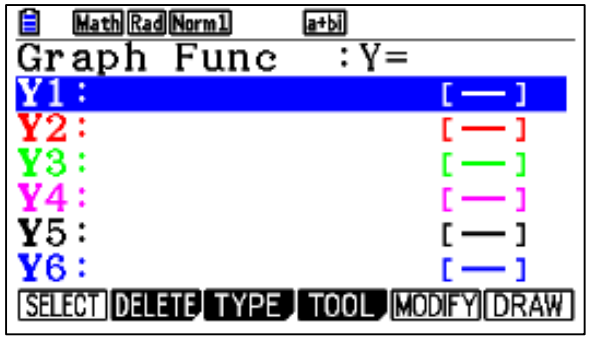
Example:

1. Draw the following piecewise functions.

$$X=\begin{cases} 3y-4 \\ y^2-2y \\ \sqrt{2y-6} \end{cases}$$

1. Got to graph mode MENU 5

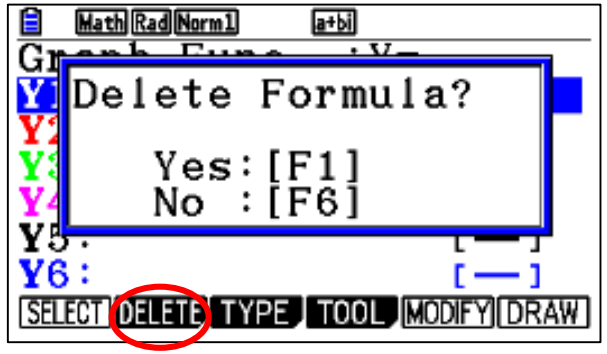


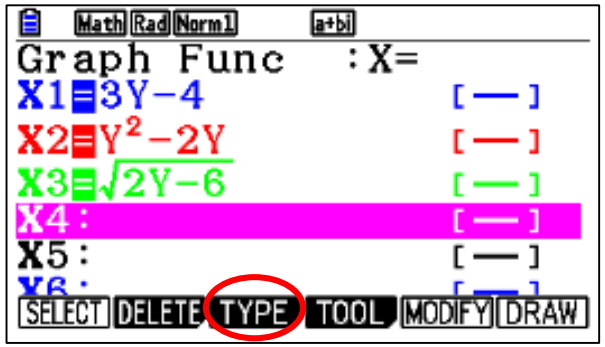


2. Delete the previous function and write the new function (use type X=).

F2 F1

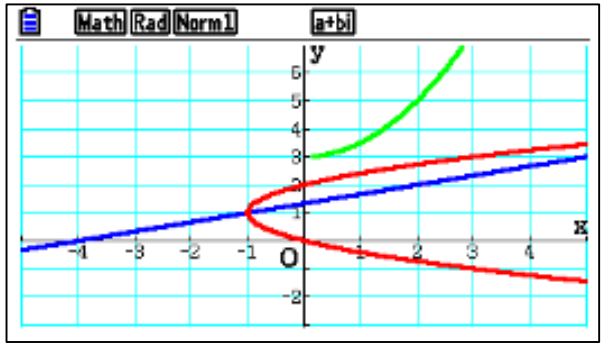
3 X,θ,T − 4 EXE X,θ,T x^2 −
2 X,θ,T EXE SHIFT x^2 2 X,θ,T − 6 EXE





3. To see the graph press F6

Modify the V-window if required:

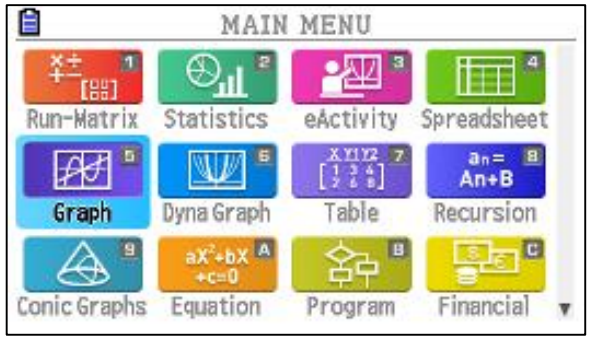


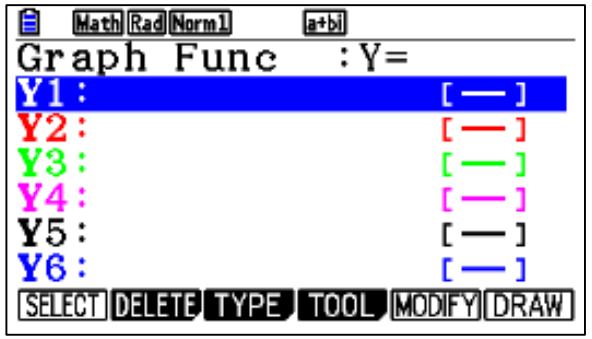
Example:

1. Draw the following parametric function.

$$x = t^2 + t, \qquad y = 2t - 1$$

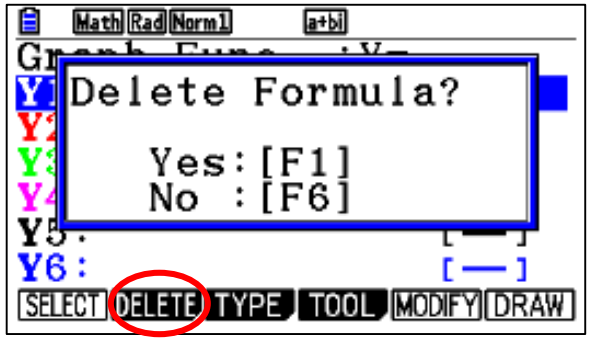
1. Got to graph mode MENU 5

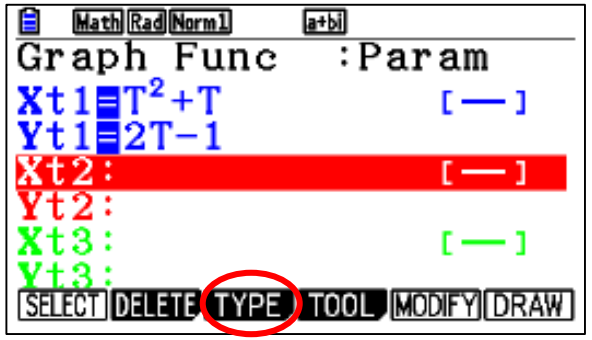




2. Delete the previous function and write the new function (use parametric type).

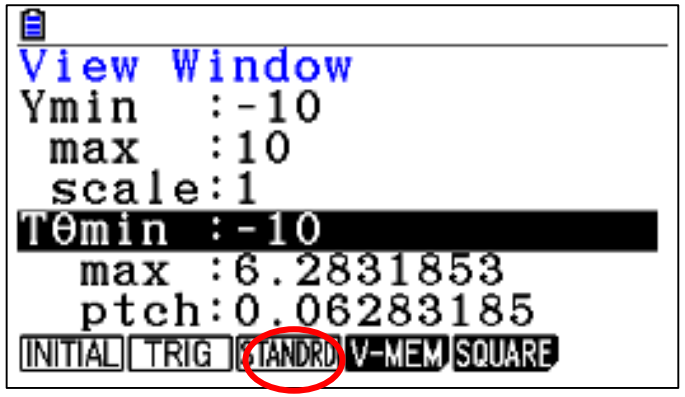
F2 F1 F3 F3 X,θ,T x^2 + X,θ,T EXE 2 X,θ,T − 1 EXE



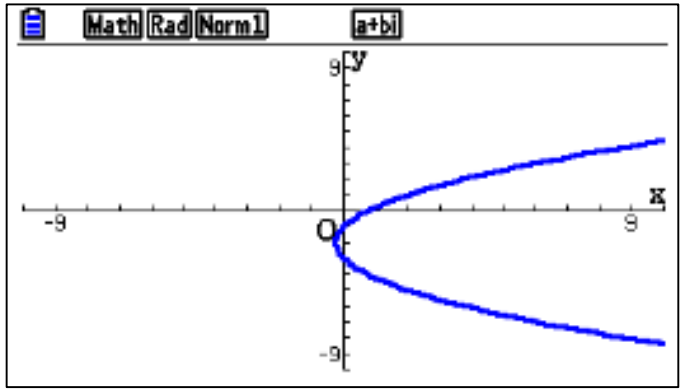


3. Modify the V-windows as the following

SHIFT F3 F3 ▲ ▲ ▲ − 1 0 EXE ▲



4. To see the graph press EXIT F6

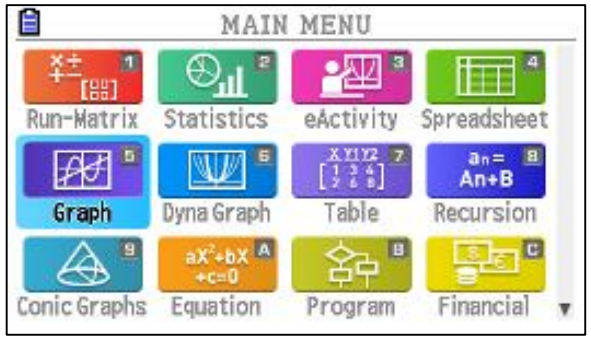


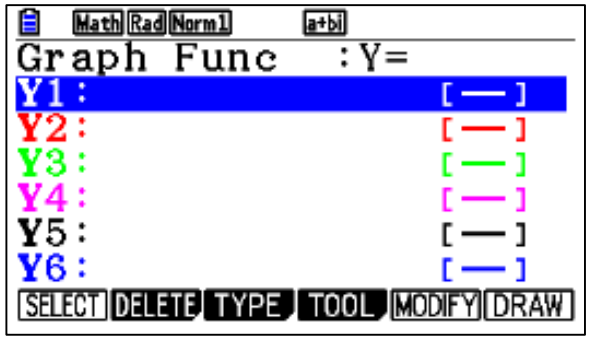
Example:

1. Draw the following function in polar coordinate.
2. Sketch the tangent and normal at 0

$$r = 1 + \sin\theta$$

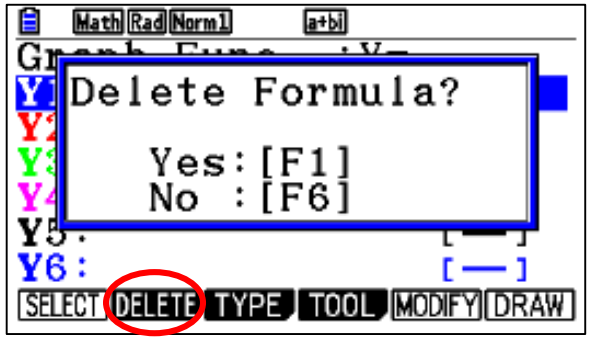
1. Got to graph mode MENU 5



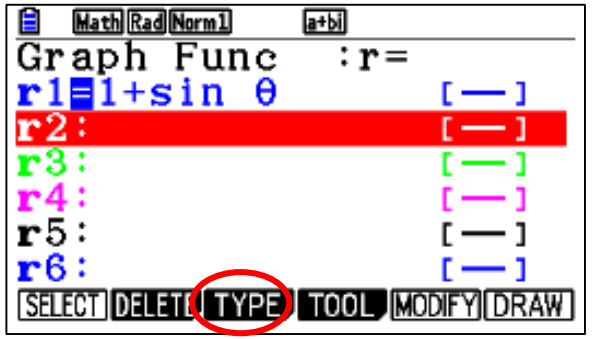


2. Delete the previous function and write the new function (use polar type).

F2 F1



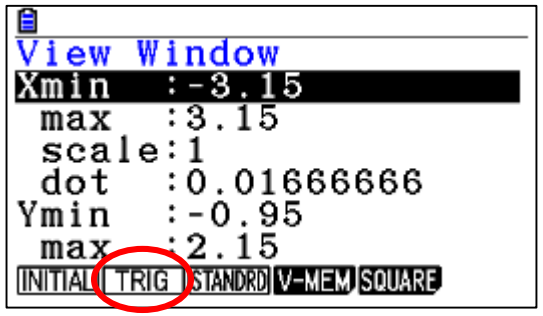
F3 F2 1 + sin X,θ,T EXE

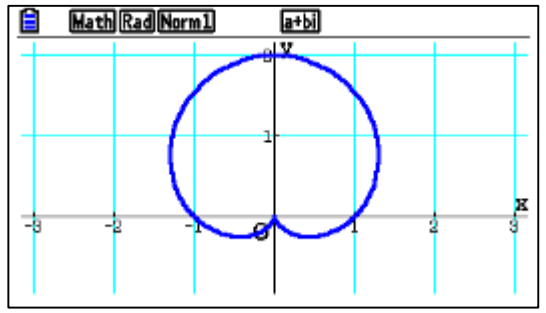


3. To see the graph press F6

Make sure that the Angle unit is RAD SHIFT MENU

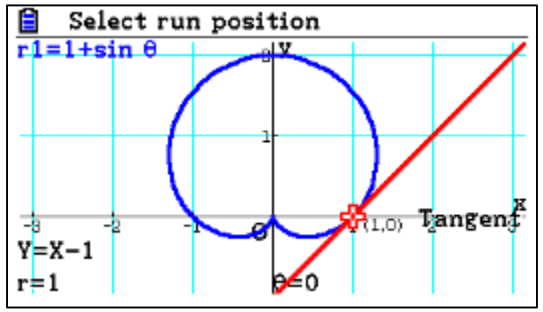
Modify the V-window if required and use + for zoom in:





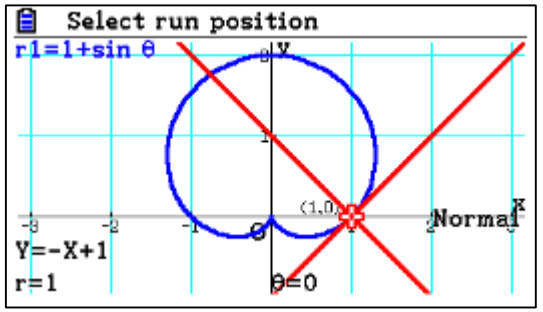
4. Sketch the tangent and norm at $\theta = 0$

F4 F2 0 EXE



Tangent

F4 F3 EXE



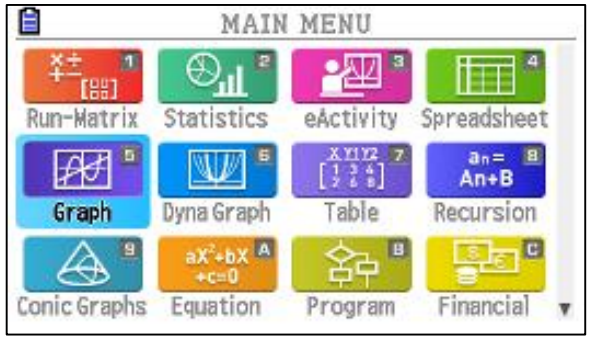
Norm

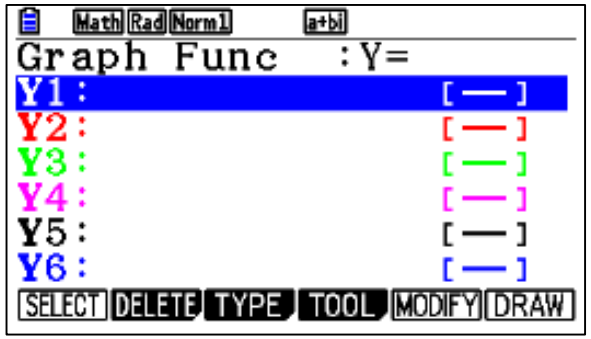
Example:

1. Draw the following function in polar coordinate.
2. Sketch the tangent and normal at 0

$$r = \cos 3\theta \qquad r = \sin 3\theta$$

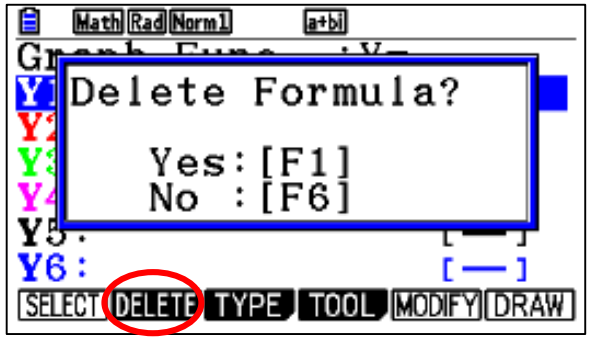
1. Got to graph mode MENU 5



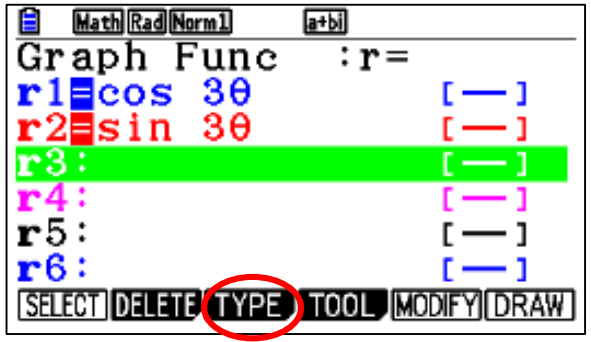


2. Delete the previous function and write the new function (use polar type).

F2 F1



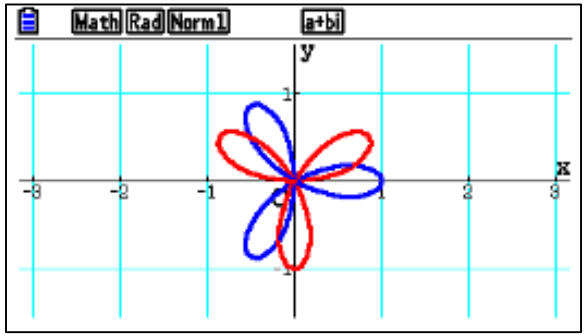
F3 F2 cos 3 X,θ,T EXE sin 3 X,θ,T EXE



3. To see the graph press F6

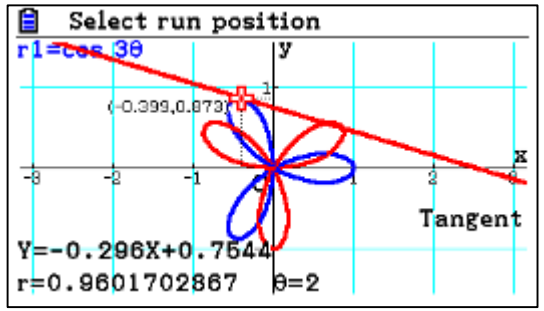
Make sure that the Angle unit is RAD SHIFT MENU

Modify the V-window if required and use + for zoom in:



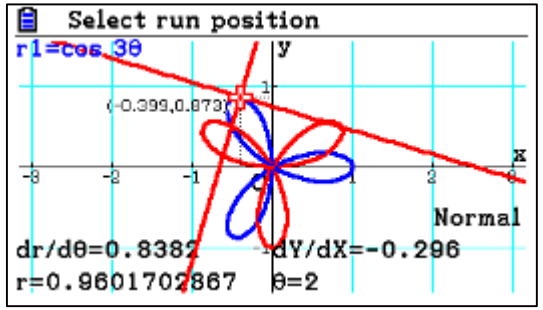
4. Sketch the tangent and norm at θ =2

F4 F2 2 EXE EXE



Tangent

F4 F3 2 EXE

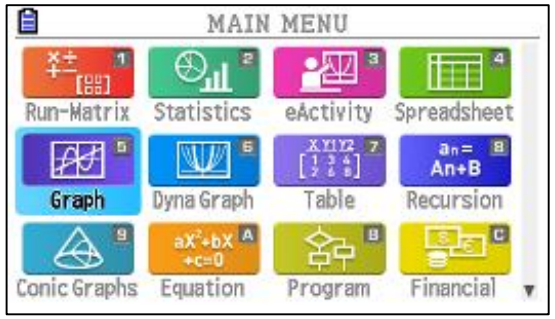


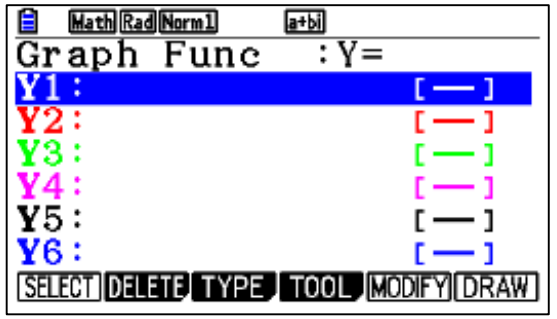
Norm

Example: Draw the following piecewise function.

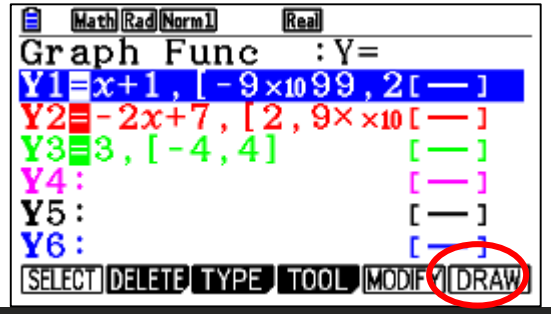
$$f(x) = \begin{cases} x+1 & x < 2 \\ -2x+7 & x \geq 2 \\ 3 & -4 < x < 4 \end{cases}$$

1. Got to graph mode MENU 5

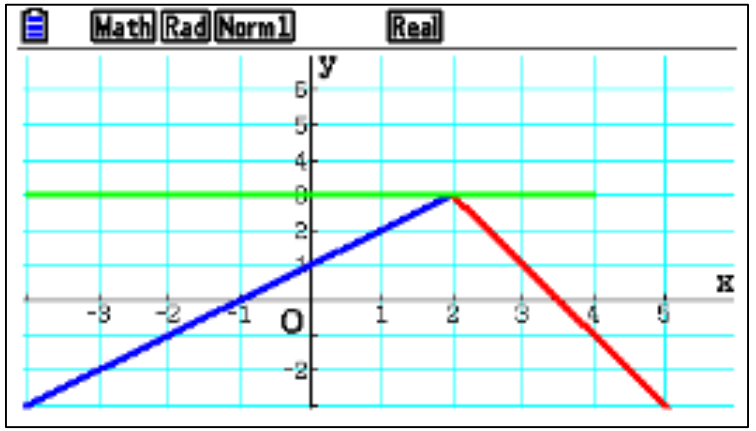




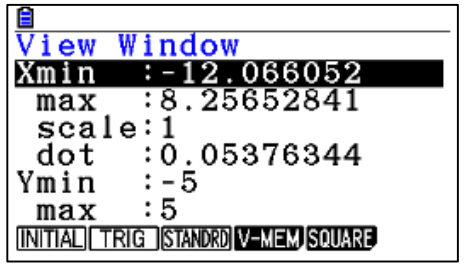
2. Select the type (Y=) and write the functions

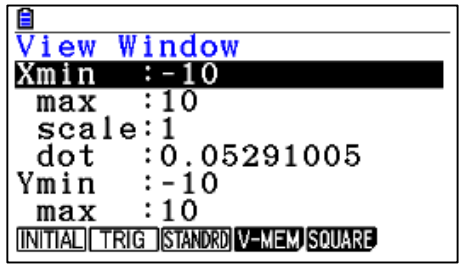


3. To see the graph press F6



4. To modify the V-windows F3 F3 EXIT F6



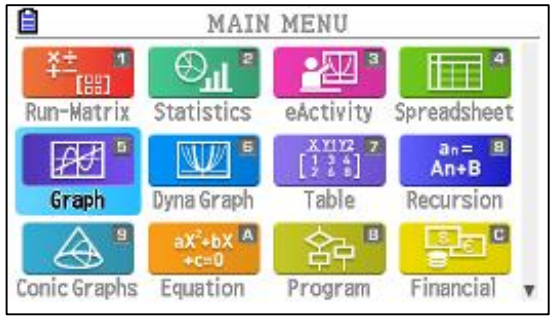


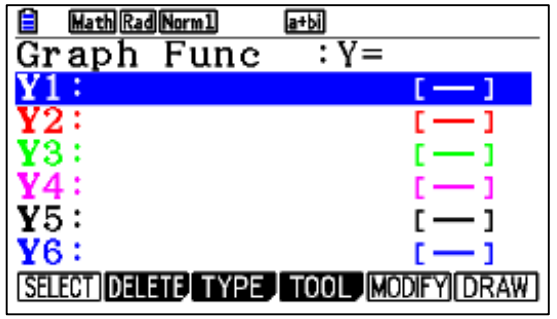
- You can choose any scale for the axis or from the exist options (Initial, Trig, Standard).
- Use the arrows and + \ - for zoom in\out.

Example: Draw the following piecewise function.

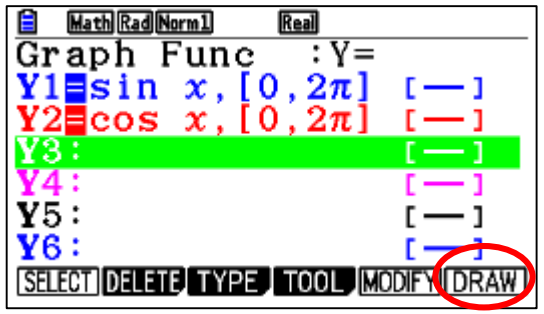
$$f(x) = \begin{cases} sinx\ , 0 \le x \le 2\pi \\ cosx\ , 0 \le x \le 2\pi \end{cases}$$

1. Got to graph mode MENU 5

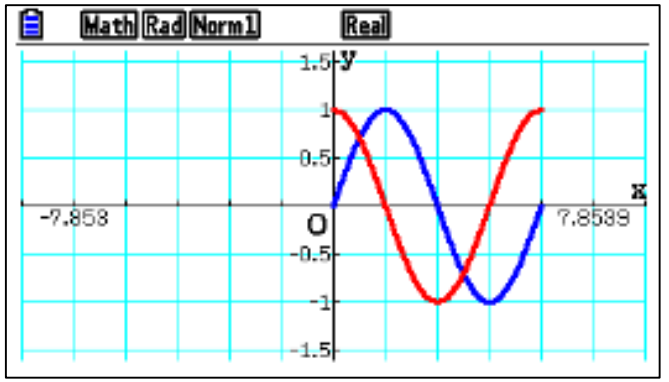




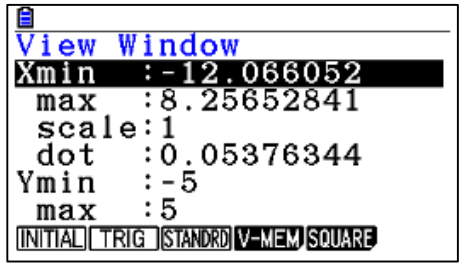
2. Select the type (Y=) and write the functions

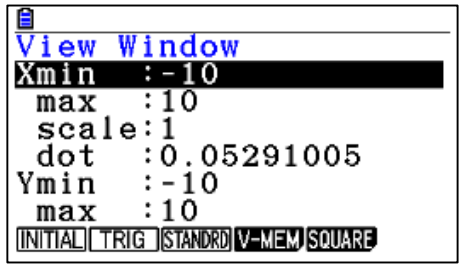


3. To see the graph press F6



4. To modify the V-windows F3 F2 EXIT F6



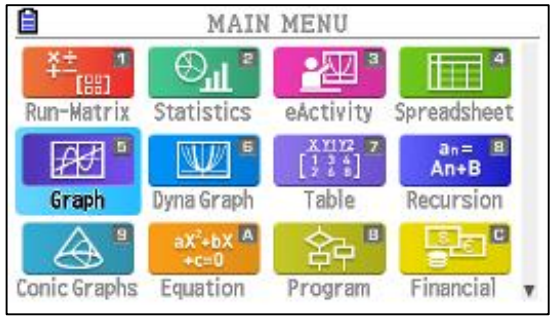


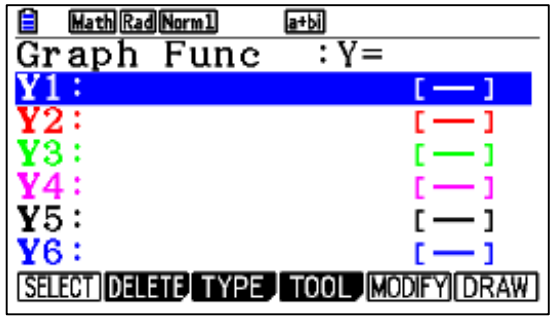
- You can choose any scale for the axis or from the exist options (Initial, Trig, Standard).
- Use the arrows and + \ - for zoom in\out.

Example: Draw the following piecewise function.

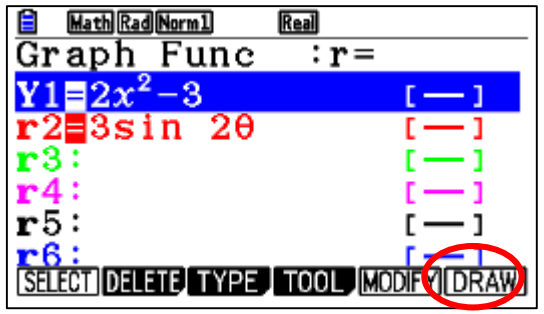
$$f(x) = \begin{cases} 2x^2 - 3 \\ 3\sin 2\theta \end{cases}$$

1. Got to graph mode MENU 5

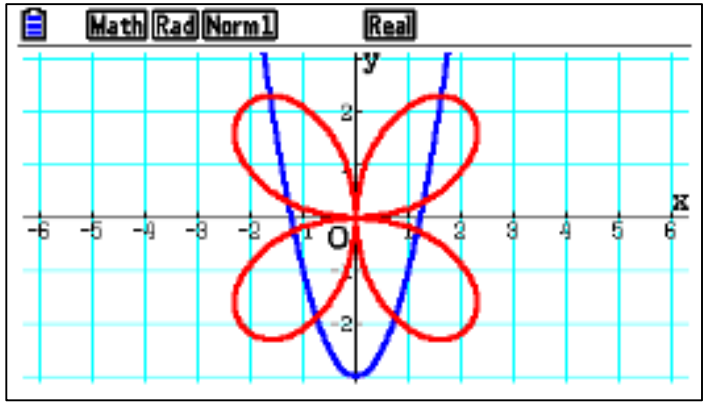




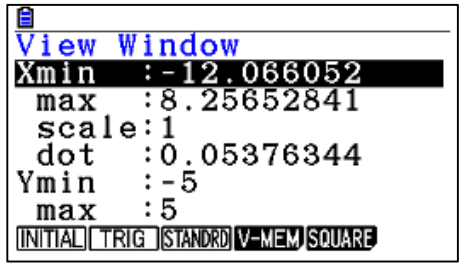
2. Select the type (Y=) and write the functions

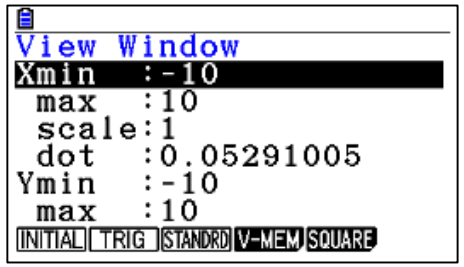


3. To see the graph press F6



4. To modify the V-windows F3 F1 EXIT F6





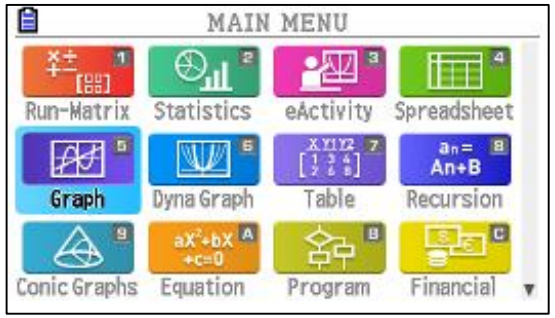
- You can choose any scale for the axis or from the exist options (Initial, Trig, Standard).
- Use the arrows and + \ - for zoom in\out.

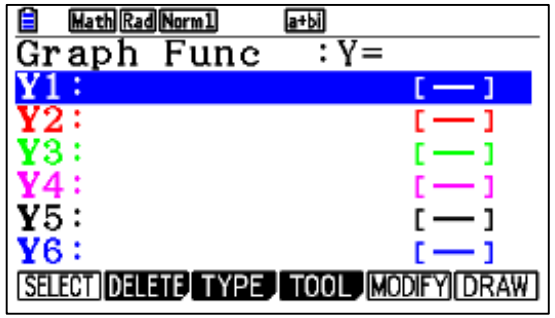
Example: Solve the following inequalities

$$x - 2y < 6 \qquad y > \frac{1}{2}(x-6)$$

$$y \leq \frac{-3}{2}x + 5 \qquad y \leq \frac{-3}{2}x + 5$$

1. Got to graph mode [MENU] [5]

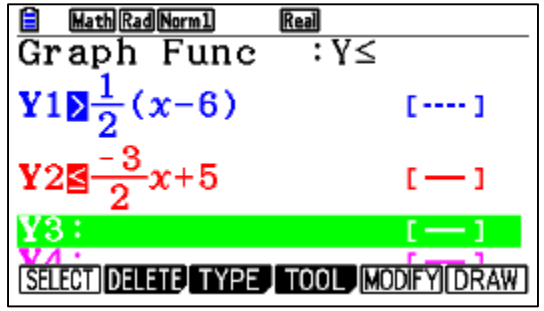




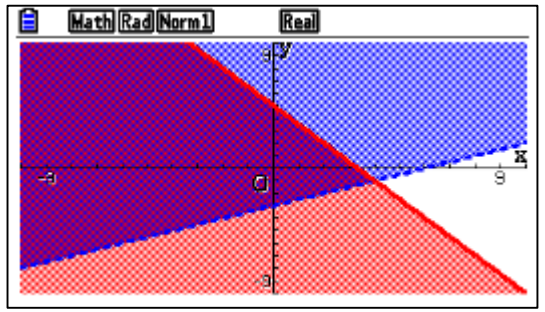
2. Select the right type and write the functions

[F3] [F6] [F1] [1] [▼] [2] [▶] [(] [X,θ,T] [−] [6] [)] [EXE]

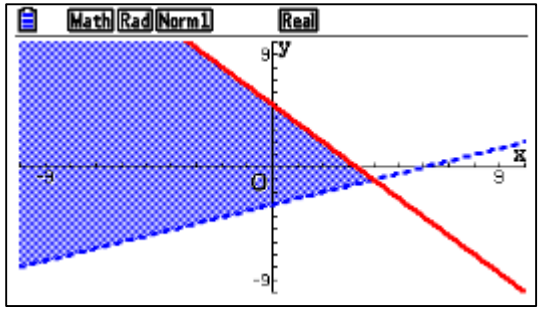
[F3] [F6] [F4] [−] [3] [▼] [2] [▶] [X,θ,T] [+] [5] [EXE]



3. Draw the functions [F6]



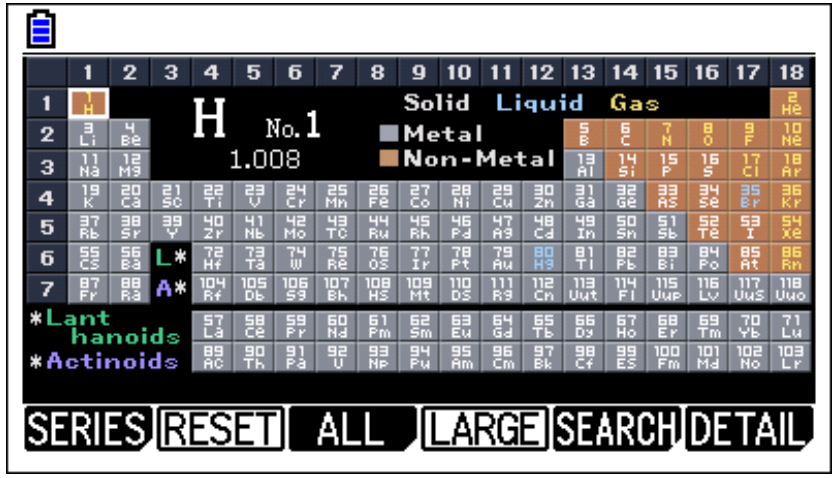
Union

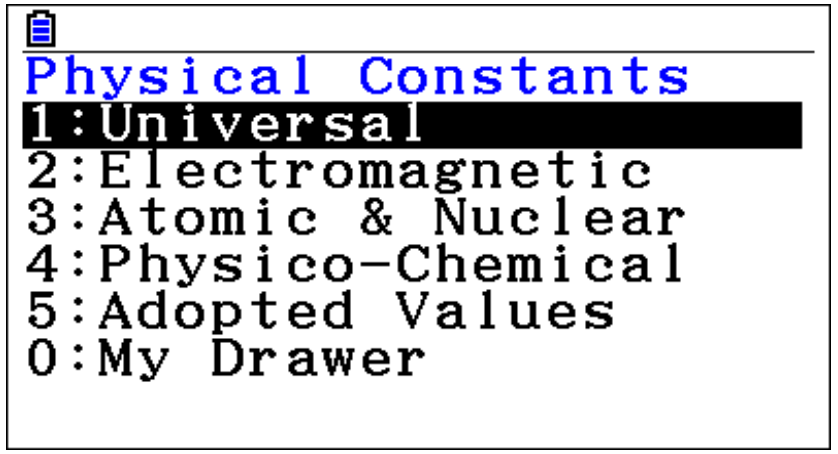


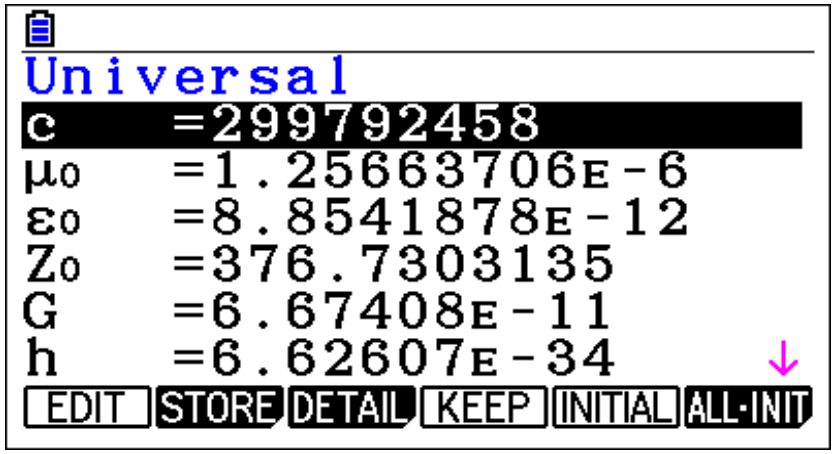
intersection

Physium

Use the periodic table to find detailed information about any element (mass number, atomic number,,,).





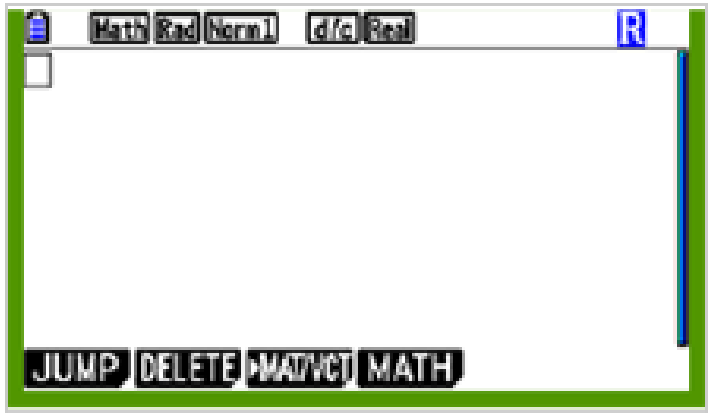


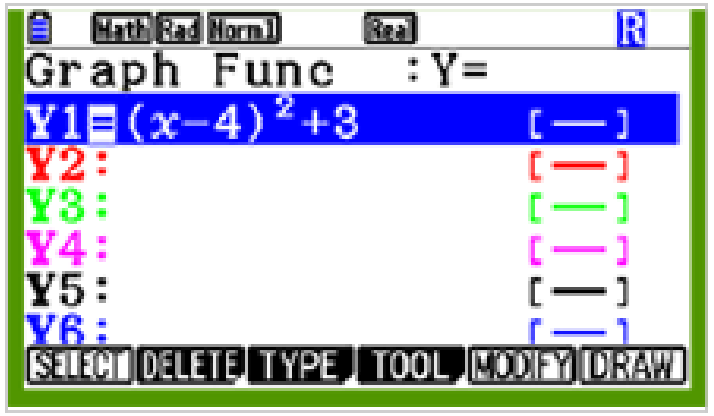
This mode allows you to quickly prepare your calculator for exams. This mode restricts access to memory, programs, functions and applications, so that these features would not be available during exams.

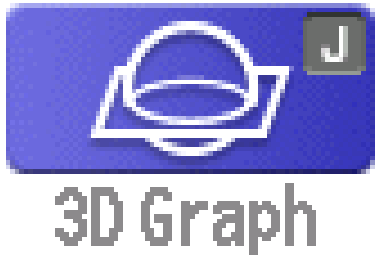
Effective for Examinations in school

Entering Exam mode:

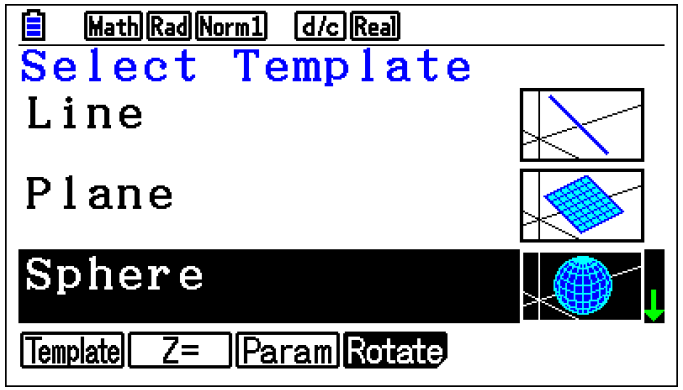
1. Turn off the calculator
2. While holding [cos] and [7] keys, press the [AC/ON] key.

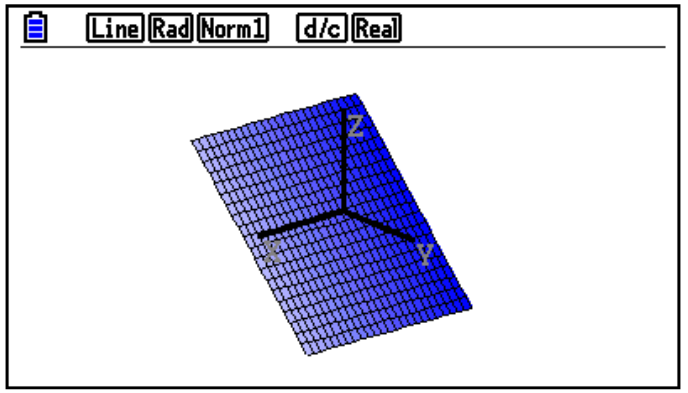


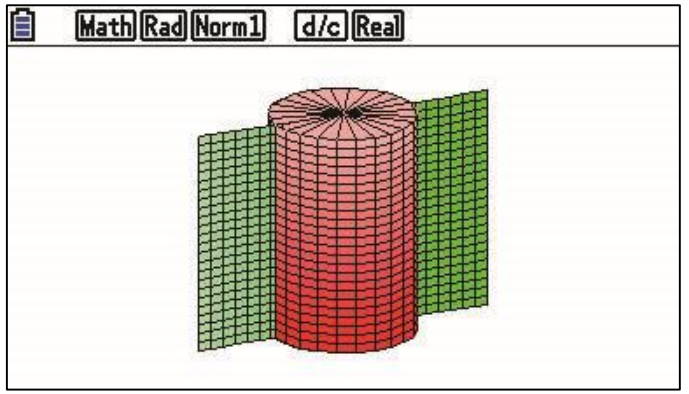


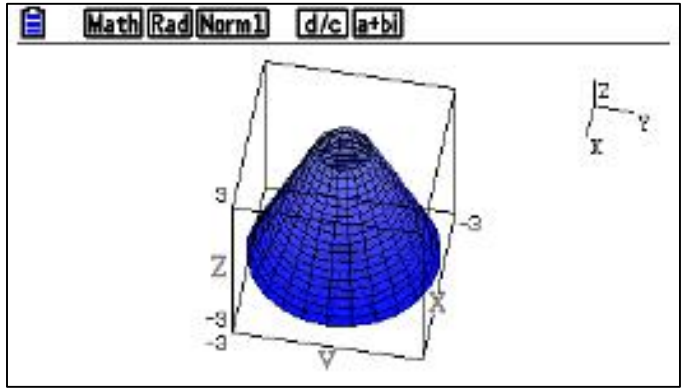


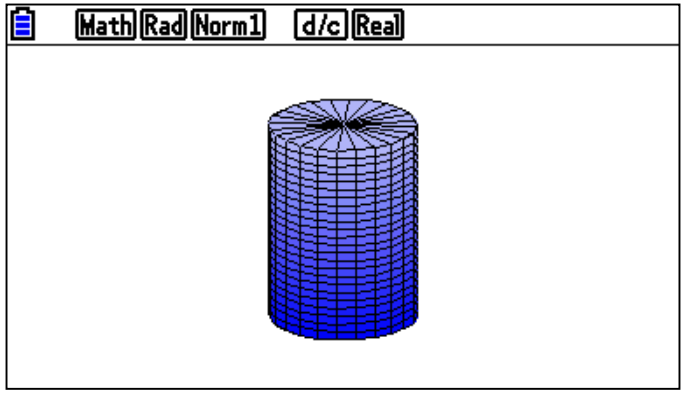
Use ◀ or ▶ on the directional keypad to rotate the view horizontally,
and ▲ or ▼ to rotate vertically.
Use ⊕ to zoom in and ⊖ to zoom out.

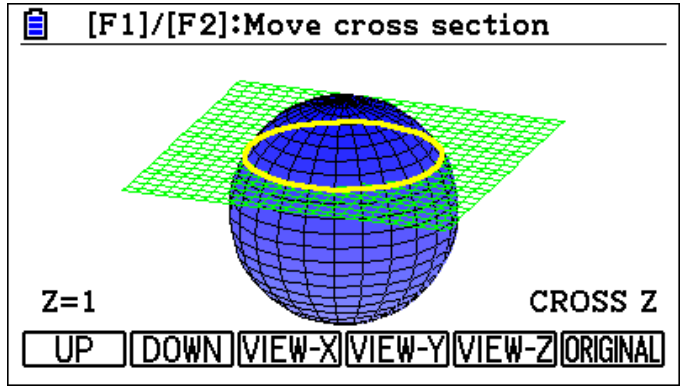










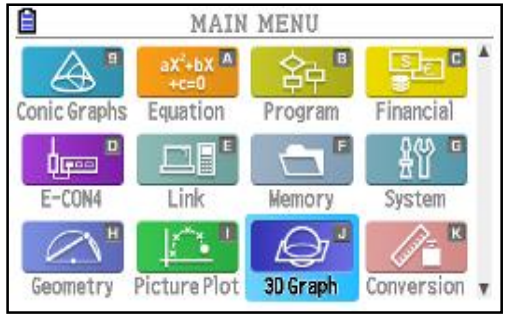


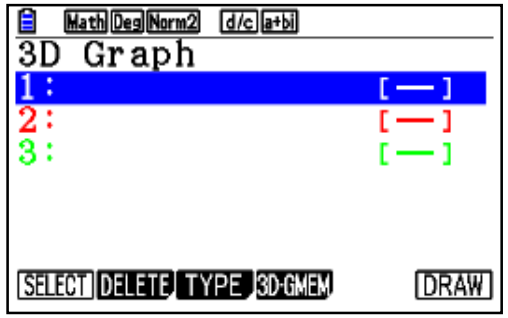
3D Graphing

Application on space subject. How to illustrate the intersection between a line and a plane.

Discuss the intersection between plane $x + y + z + 5 = 0$ and line $\frac{x-2}{4} = \frac{y-3}{5} = \frac{z-1}{6}$

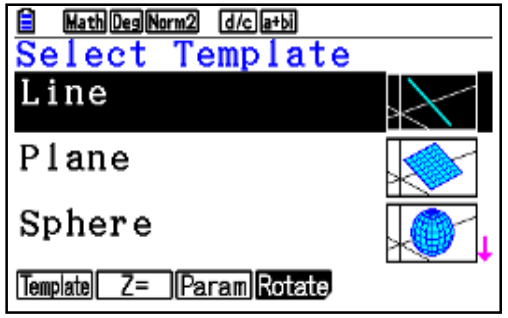
1. Log into 3D graph MENU ❯

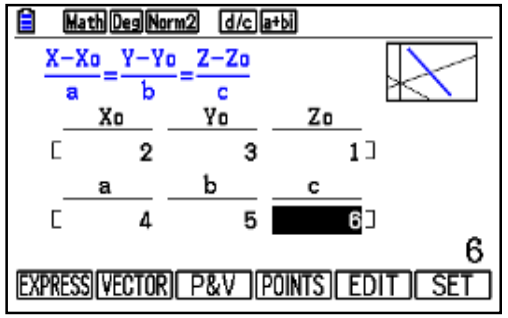




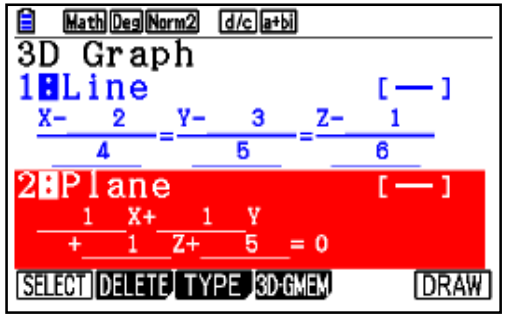
2. Click F3 then choose line

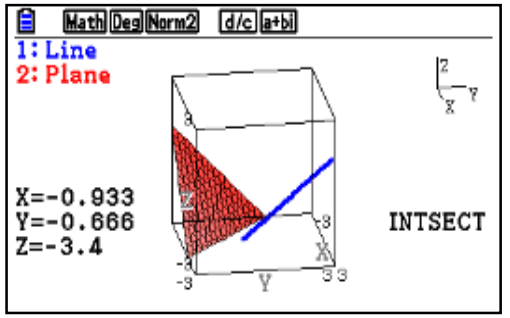
Input data then EXE





3. Move arrow down and Click F3 then choose plane then Input data then EXE EXE

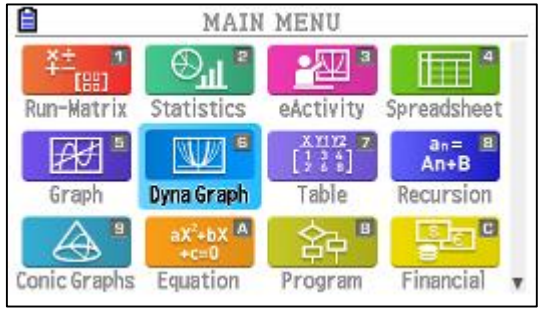


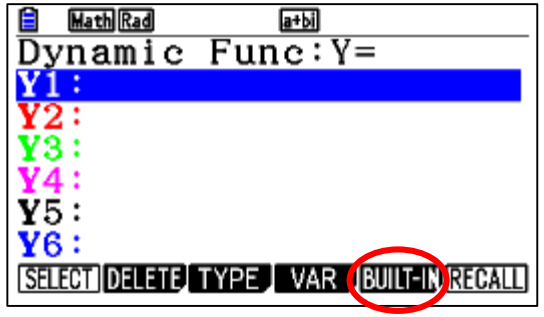


Dyna Graph

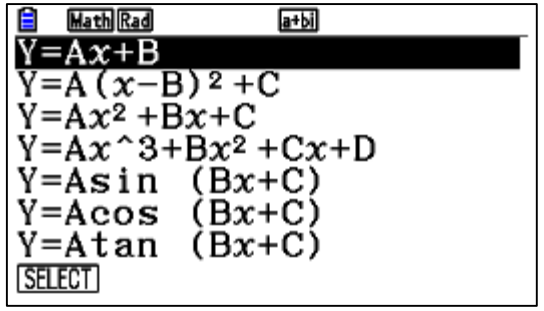
Dynamic Graph: to draw multiple versions of a graph by changing the values assigned to the variables in a function.

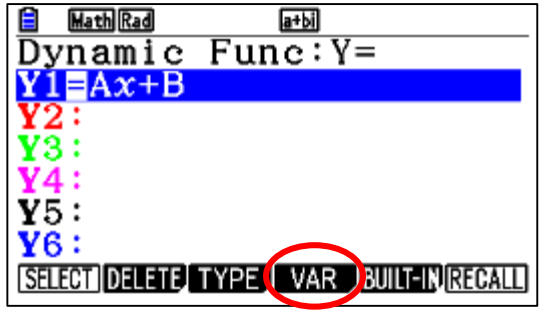
1. enter the dynamic mode: MENU 6



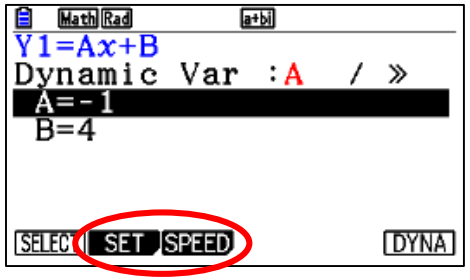


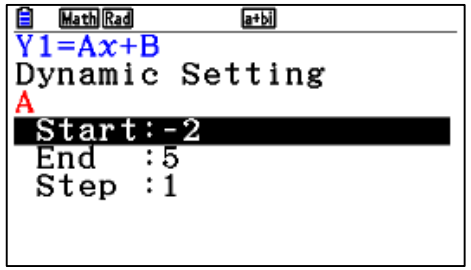
2. Write any function or select from the built in. F5

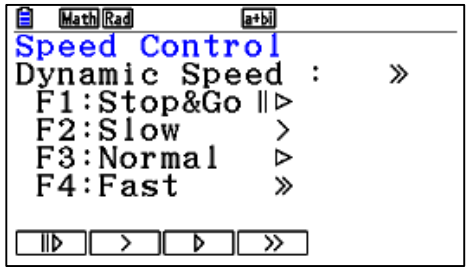




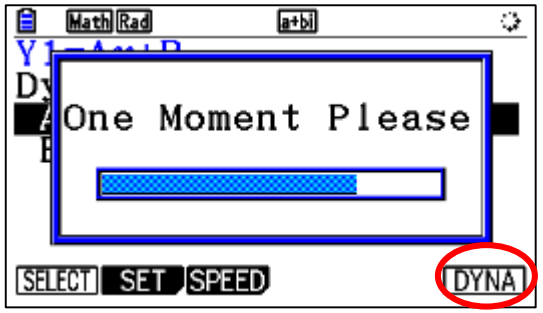
3. To set the dynamic settings: F4 F2 EXIT F3 EXIT

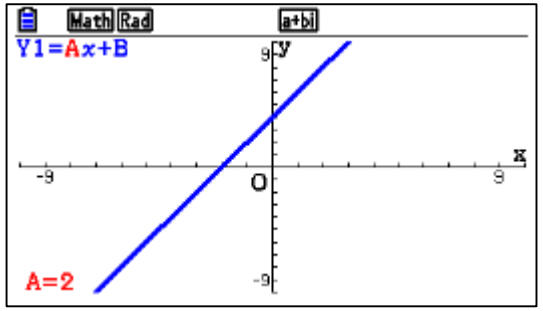






4. To set the dynamic graph and the changes: F6





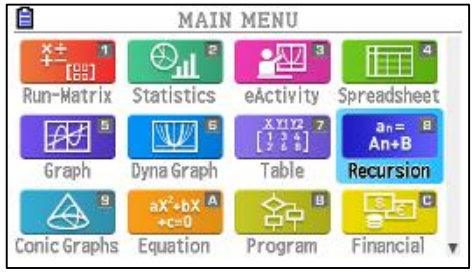
5. To exit the dynamic: AC/ON

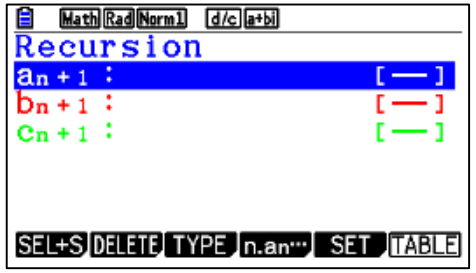
RECURSION

an = An+B 8

Recursion

Write a sequence, and find a table of values for its terms.



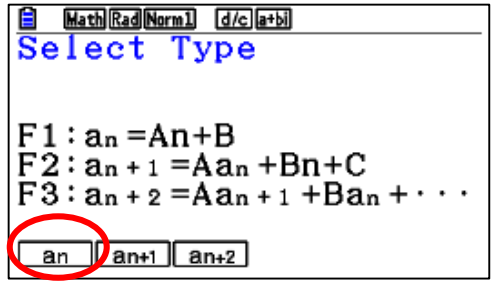


Example: Consider the following : $an = 3n + 4$
Write the sequence from a1 to a10

Exercise: Consider the following : $an = 2n + 5$
Write the sequence from a1 to a6

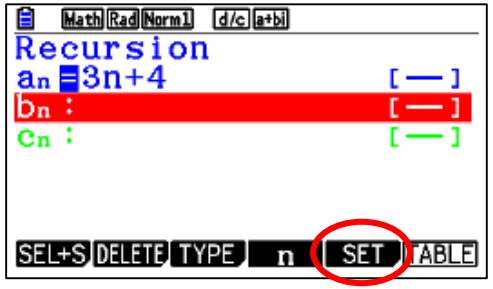
1- select type

F3 F1



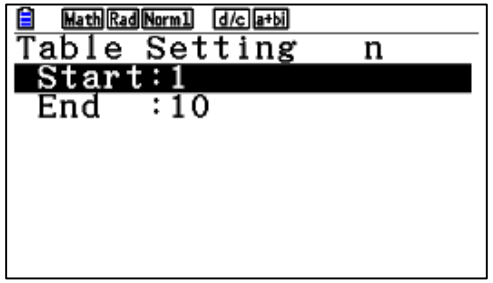
2- write the formula

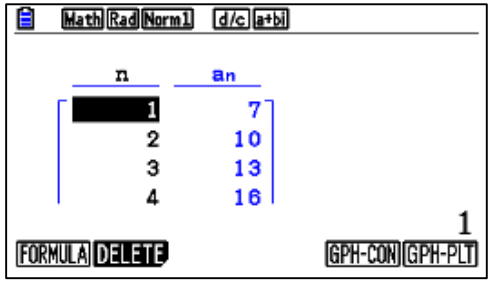
3 F1 + 4 EXE



3- set starting n and ending n

F5 1 EXE 1 0 EXE EXE EXE

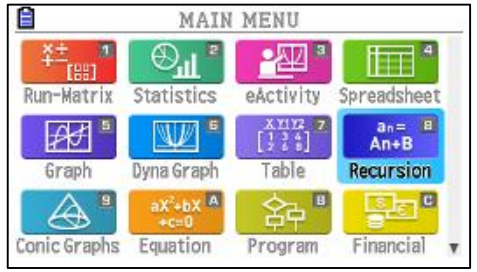


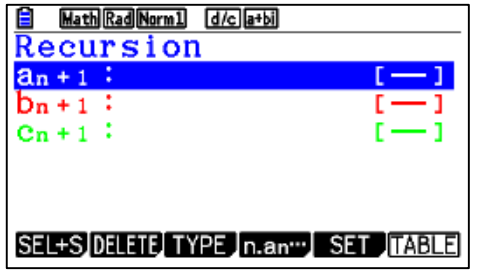


an = An+B 8

Recursion

Write a sequence, and find a table of values for its terms.





Example: consider the following :

$a_{n+1} = a_n + 4n \; such \; that \; a_0 = 2$

Write the sequence from a1 to a10

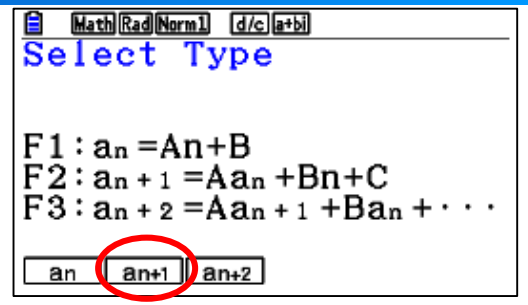
Exercise: consider the following :

$a_{n+1} = a_n + 5n + 6 \; such \; that \; a_0 = 3$

Write the sequence from a1 to a5

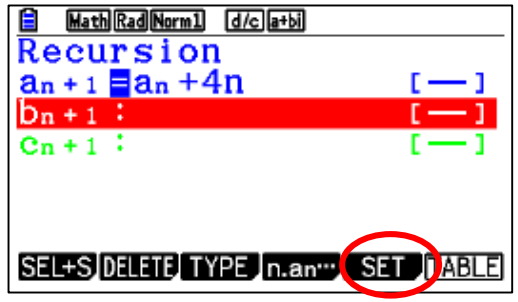
1- select type

EXIT EXIT F2 F1 F3 F2



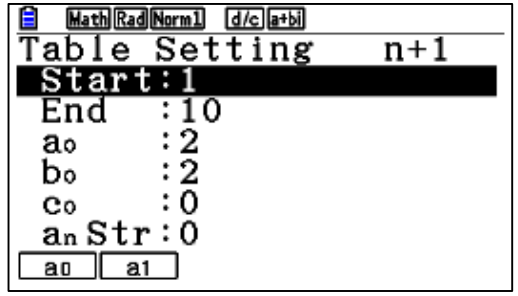
2- write the formula

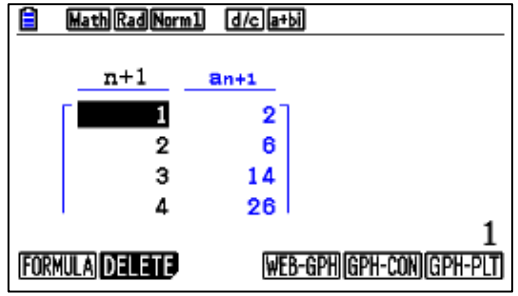
F4 F2 + 4 F1 EXE



3- set starting n and ending n

F5 1 EXE 1 0 EXE 2 EXE EXIT F6

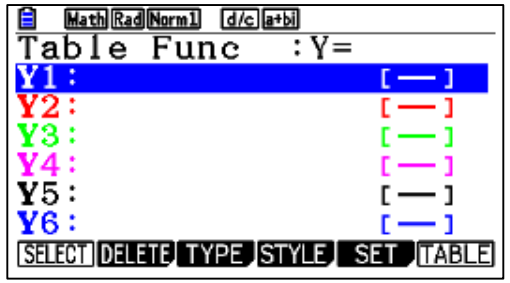




Table

Go to table mode

MENU 7



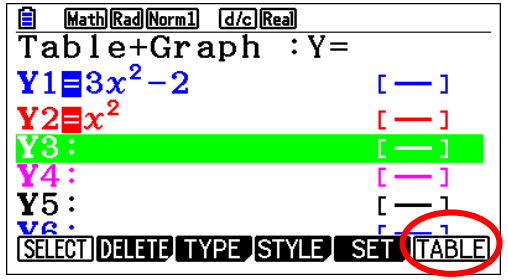
Example Store the two functions below, generate a number table, and then draw a line graph. Specify a range of –3 to 3, and an increment of 1.

$y1 = 3x^2 - 2$
$y2 = x^2$

Use the following V-Window settings.
Xmin = 0, Xmax = 6, Xscale = 1
Ymin = –2, Ymax = 10, Yscale = 2

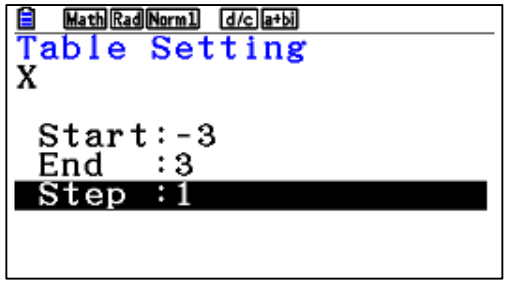
1. Fill the functions

3 X,θ,T x^2 − 2 EXE X,θ,T x^2 EXE



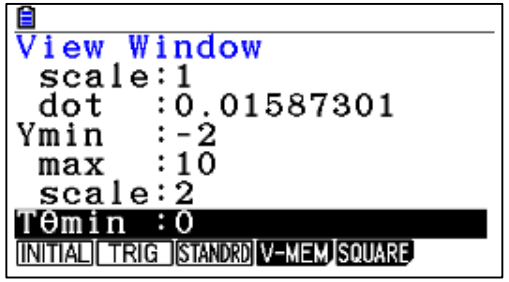
2. Set the range

F5 − 3 EXE 3 EXE EXE

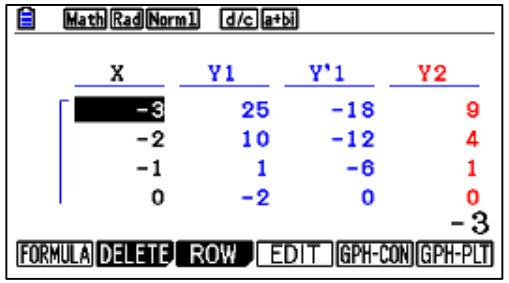


3. V-windows setting

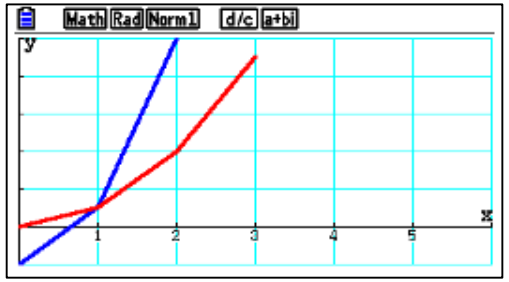
SHIFT F3 0 EXE 6 EXE 1 EXE
▼ − 2 EXE 1 0 EXE 2 EXE



4. To see the table EXIT F6



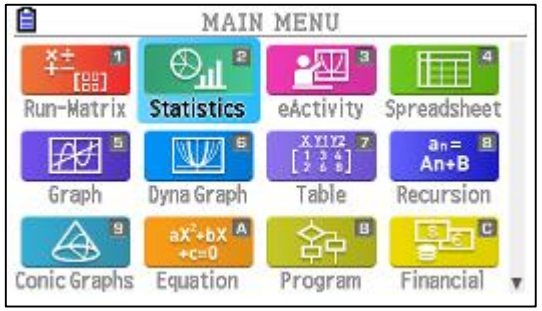
5. To see the graph F5

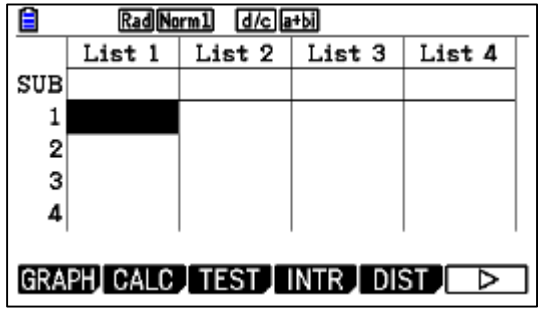


Support Classroom with Technology

STATISTICS

To enter the Statistics mode: MENU 2

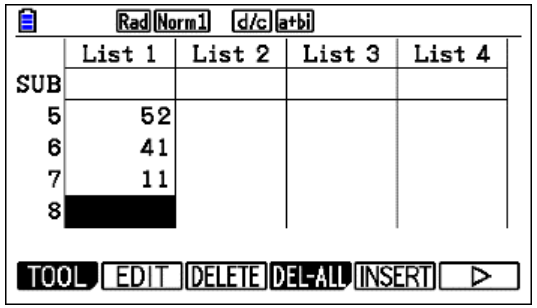




Entering Data

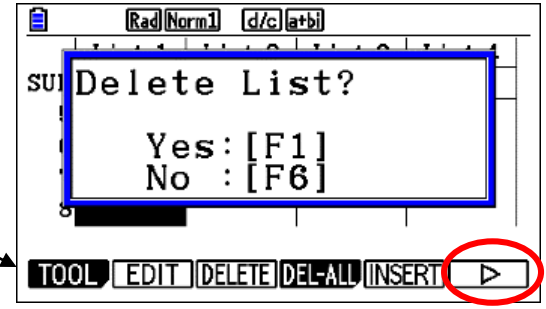
Consider the data set: {15, 22, 32, 31, 52, 41, 11}
Enter the data in List 1 on the calculator.
Use your arrow keys to move between lists

1 5 EXE 2 2 EXE 3 2 EXE 3 1
EXE 5 2 EXE 4 1 EXE 1 1 EXE



Clearing Data:

To clear all data from a list:
(*use F6 to change options at the bottom of the screen*)

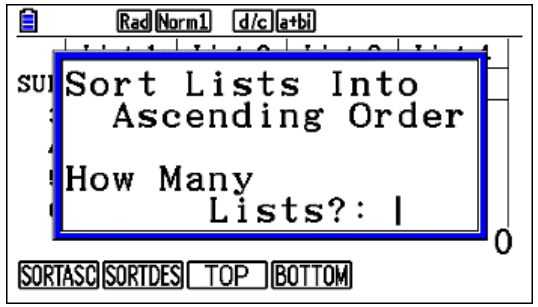


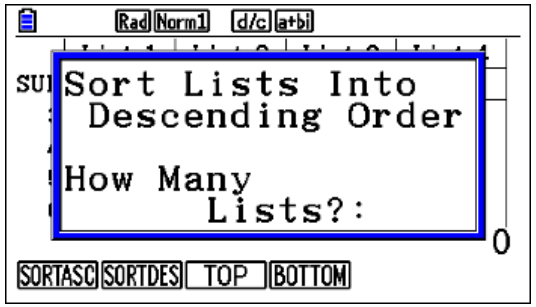
- To clear an individual entry: Select the value and press DEL.
- To edit an individual entry: Select the value and press F2 Edit.

Sorting Data: (helpful when finding the mode)

Ascending order (lowest to highest) Or Descending order (highest to lowest).

Tools press F1 then for Ascending order F1 Or Descending F2



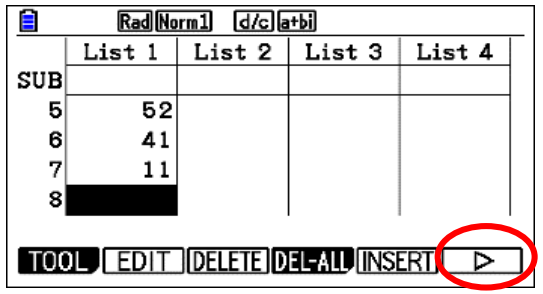


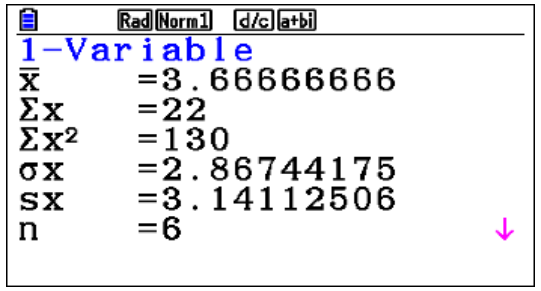
One Variable Statistical Calculations:

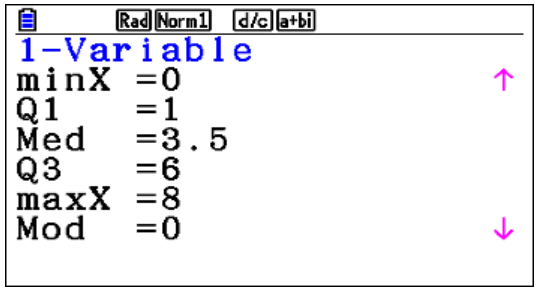
For the same previous data set: {15, 22, 32, 31, 52, 41, 11} :

Press F6 button, Then Choose F2 **CALC** .

Select 1-Var Stats F1, Use the down arrow ▼ to view all the information







$\bar{x}$ .....mean

Σx .....sum

Σx^2 .....sum of squares

σx .....population standard deviation

s_x .....sample standard deviation

n .....number of data items

minX.....minimum

Q1 .....first quartile

Med.....median

Q3 .....third quartile

maxX.....maximum

Mod.....mode

Mod:n .....number of data mode items

Mod:F .....data mode frequency

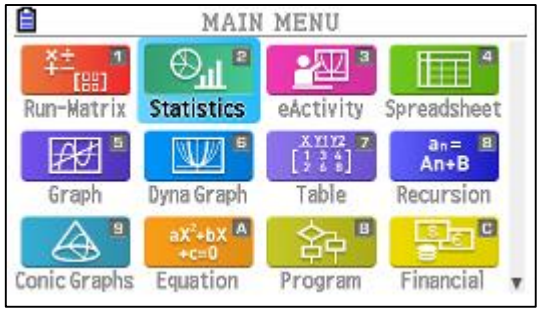
Mean, Mode, Median

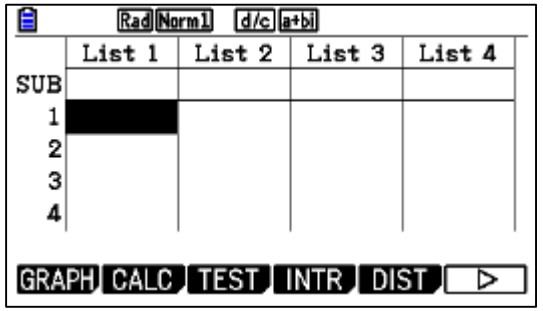
Example: Given the data set:

{13, 3, 10, 9, 7, 10, 12, 8, 6, 3, 9, 6, 11, 5, 9, 13, 8, 7, 7}

find the mean, median and mode.

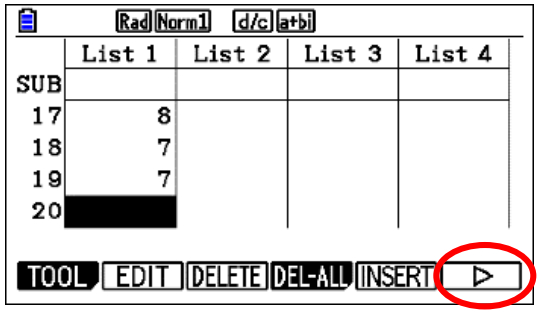
1. To enter the Statistics mode: MENU 2



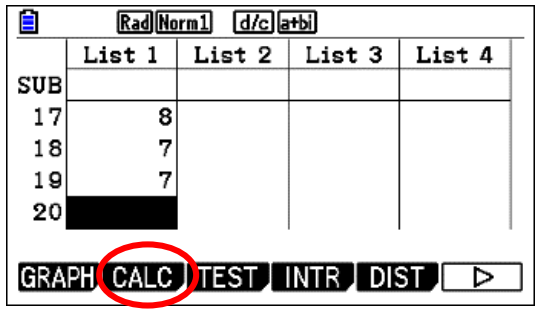


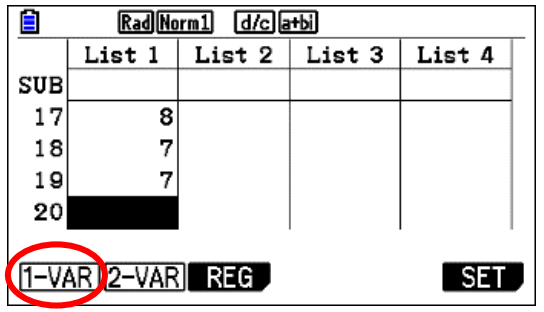
2. Clear old data and enter the new data into the lists

F6 ◀ F4 F1

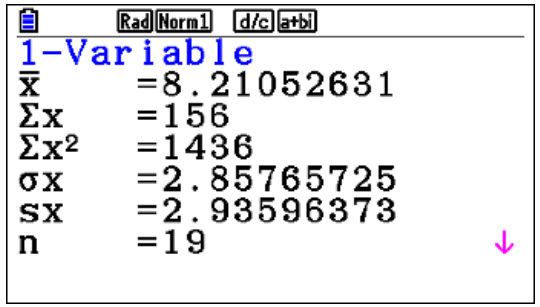


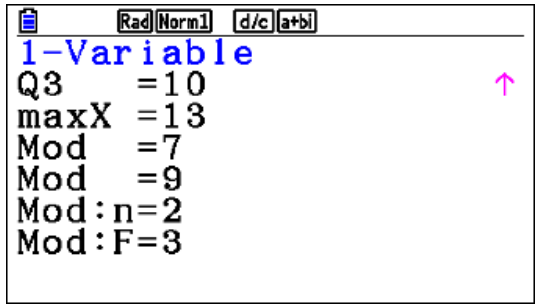
3. Press F6 F6 F2 F1 (CALC) 1-Var Stats.





Use arrow up and down to see the statistical information

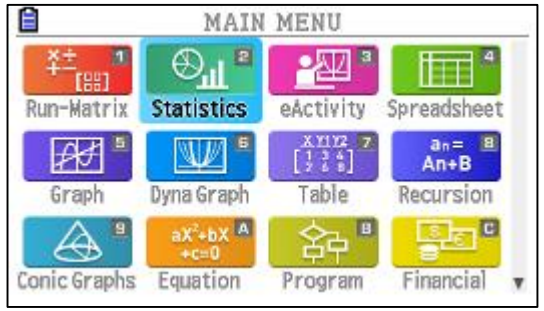


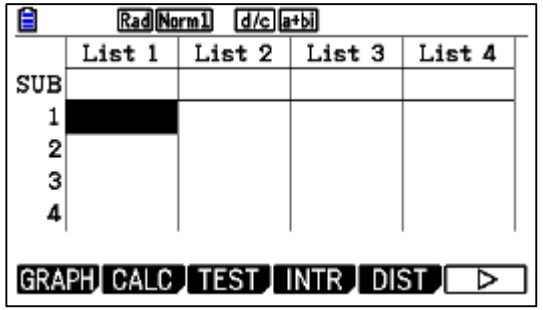


Example: From a Frequency Table:

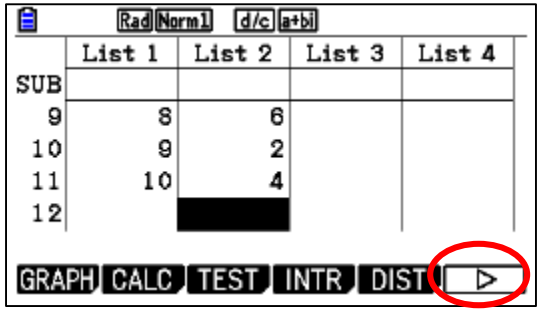
Number	0	1	2	3	4	5	6	7	8	9	10
Frequency	3	4	7	4	10	9	7	3	6	2	4

1. To enter the Statistics mode: MENU 2

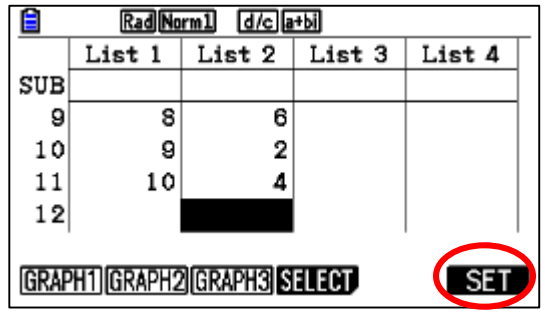




2. Clear old data and enter the new data into the lists
enter the data values in List1. enter their frequencies in List2.

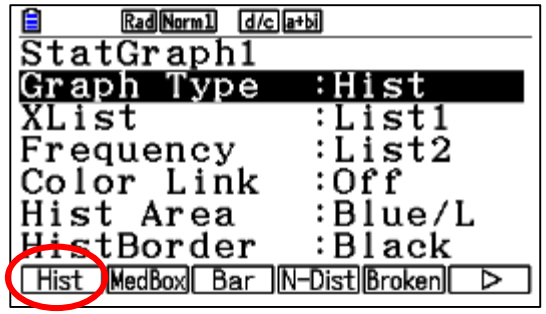


3. Select Graph : F1

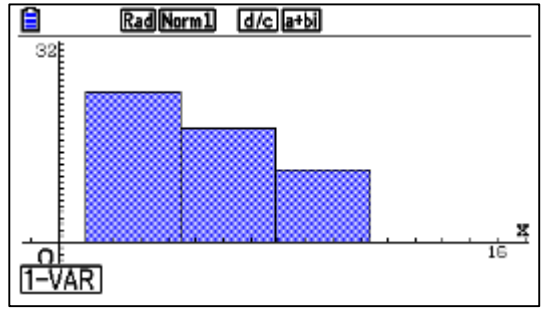


4. Set the Graph to select Histogram:

F6 ▼ F6 F1



5. Draw the Histogram: EXIT F1 EXE

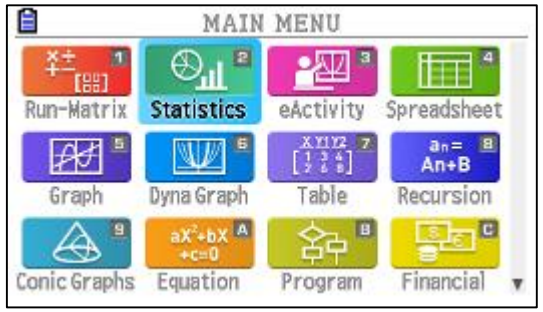


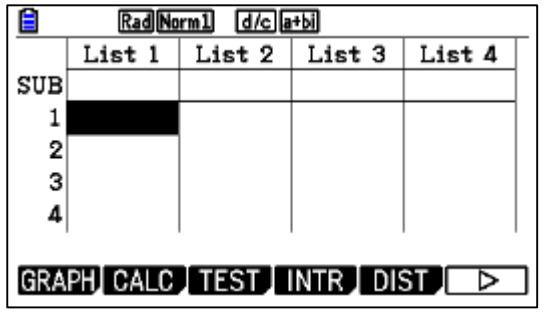
Box and Whisker Plots

Example: given the data set below, draw the Box plot.

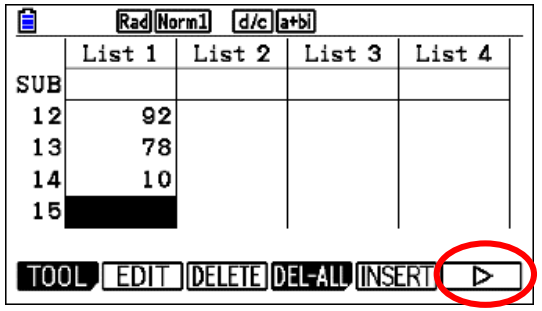
{85, 100, 97, 84, 73, 89, 73, 65, 50, 83, 79, 92, 78, 10},

1. To enter the Statistics mode: MENU 2

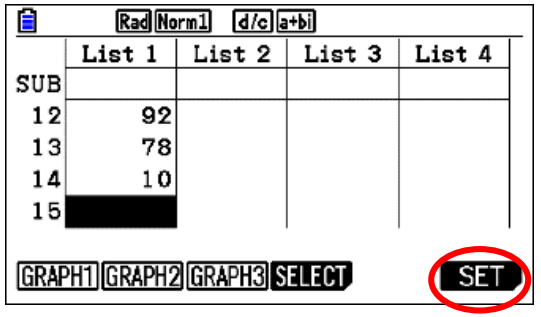




2. Clear old data and enter the new data into the list 1

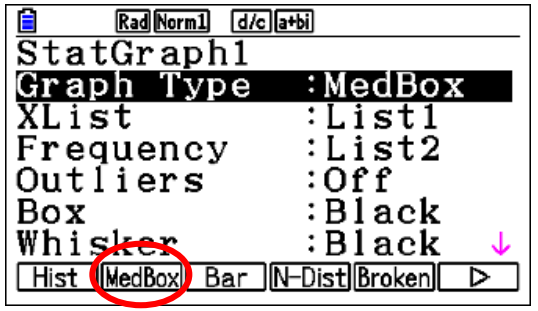


3. Change the functions to see GRAPH by using F6

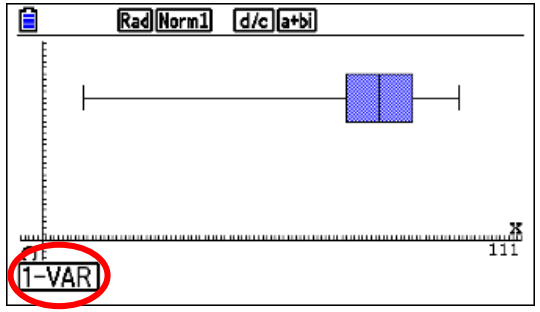


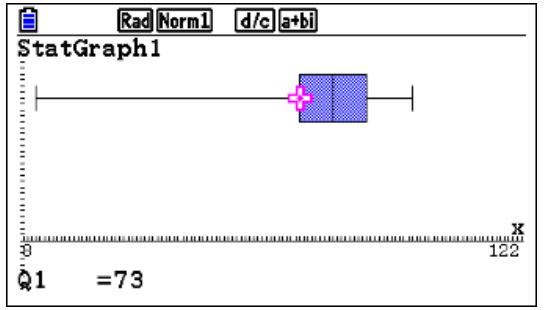
4. Set the Graph to select Medbox:

F6 ▼ F6 F2



5. To see the Box and the values of Q1 , Q2, Q3: : EXIT F1



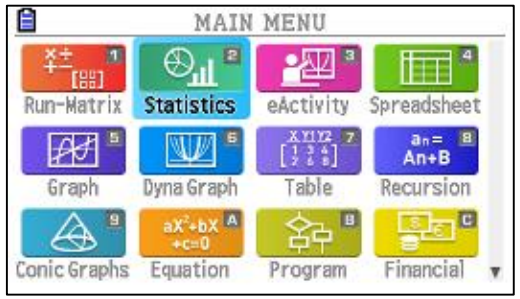


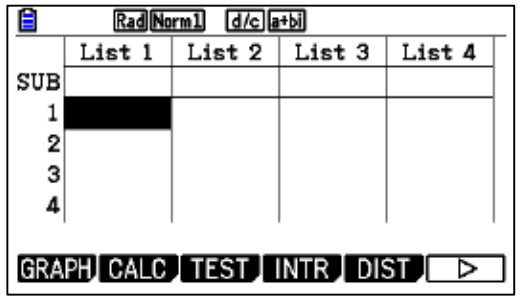
Pi Chart

Example: suppose one of the questions asked on a survey of ‘‘What type of cars do you have?’’, and the results from 44 people are shown in this table. Construct a pie chart and a bar chart of these data.

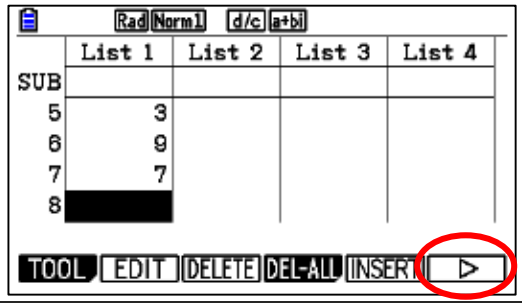
Car	Toyota	Lexus	Mercedes	BMW	Ferrari	Kia	GMC
Frequency	10	7	4	4	3	9	7

1. To enter the Statistics mode: MENU 2

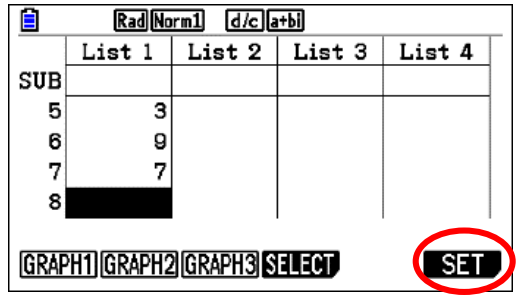




2. Clear old data and enter the new data into the list 1

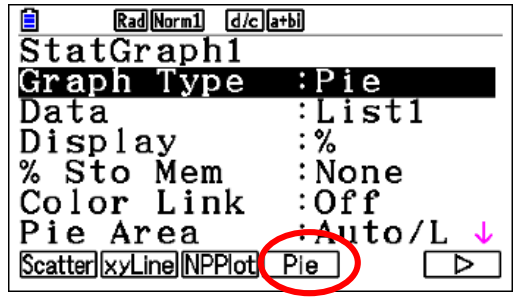


3. Change the functions to see GRAPH by using F6



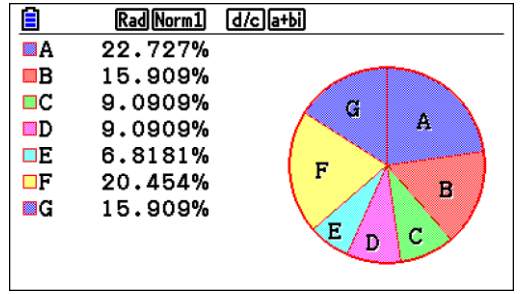
4. Set the Graph to select Pie:

F1 F6 ▼ F4



5. To see the Pie graph:

EXIT F1



Scatter Plots

A scatter plot is a graph used to determine whether there is a relationship between paired data.

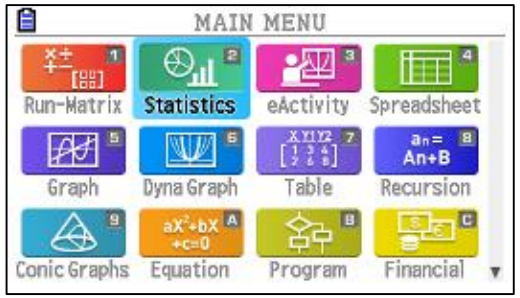
If y tends to increase as x increases, then the paired data are said to be a positive correlation.
If y tends to decrease as x increases, the paired data are said to be a negative correlation.

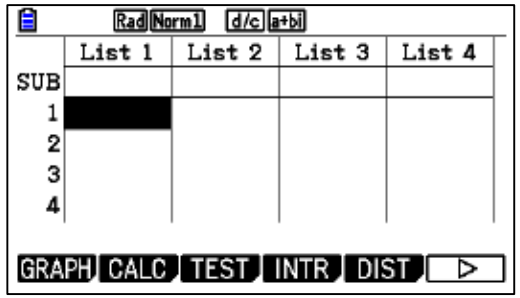
If the points show no linear pattern, the paired data are said to have relatively no correlation.

To set up a scatter plot for the following table:

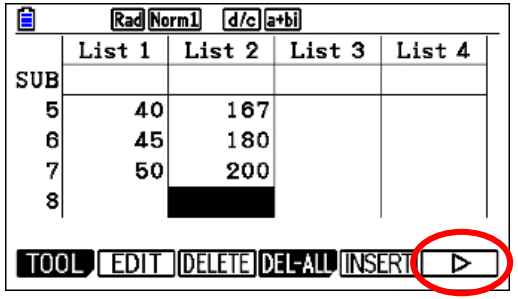
X	10	20	25	30	40	45	50
Y	120	130	148	155	167	180	200

1. To enter the Statistics mode: MENU 2



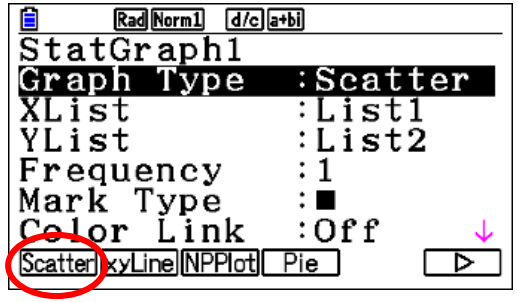


2. Clear old data and enter the new data into the list 1 and 2



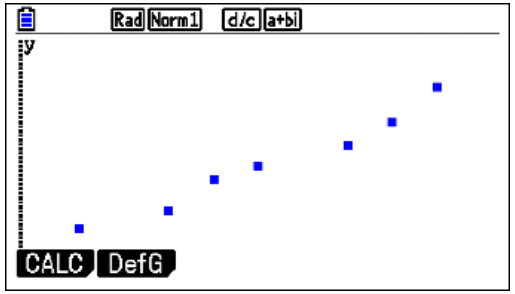
3. Change the functions to see GRAPH by using F6

and set the Graph to select Scatter: F1 F6 ▼ F1



4. To see the graph:

EXIT F1



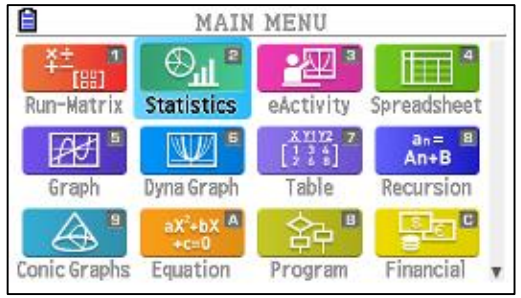
• Linear (LinReg)	y = ax + b	The graph of x versus y is linear.
Fits Linear by Transformations:		
• Logarithmic (LnReg)	y = a + b ln(x)	The graph of ln(x) versus y is linear. Calculates a and b using linear least squares on lists of ln(x) and y instead of x and y.
• Exponential (ExpReg)	y = a (b^x)	The graph of x versus ln(y) is linear. Calculates A and B using linear least squares on lists of x and ln(y) instead of x and y, and then a = e^A and b = e^B .
• Power (PwrReg)	y = a (x^b)	The graph of ln(x) versus ln(y) is linear. Calculates A and b using liner least squares on list of ln(x) and ln(y) instead of x and y, and then a = e^A.

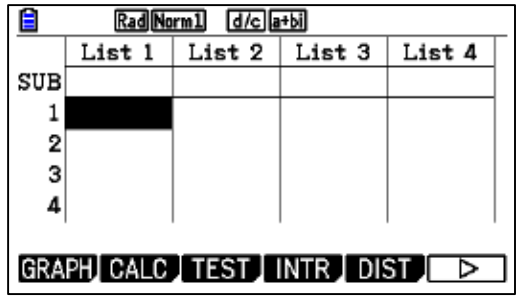
• Quadratic (QuadReg)	$y = ax^2 + bx + c$	For three points, fits a polynomial to the data. For more than three points, fits a polynomial regression.
• Cubic (CubicReg)	$y = ax^3 + bx^2 + cx + d$	For four points, fits a polynomial to the data. For more than four points, fits a polynomial regression.
• Quartic (QuartReg)	$y = ax^4 + bx^3 + cx^2 + dx + e$	For five points, fits a polynomial to the data. For more than five points, fits a polynomial regression.
• Logistic (Logistic)	$y = \frac{c}{(1 + ae^{-bx})}$	Fits equation to data using iterative least-squares fit.
• Sinusoidal (SinReg)	$y = a\sin(bx + c) + d$	Fits sine wave to data using iterative least-squares fit.

Example: determine a linear regression model equation to represent this data.

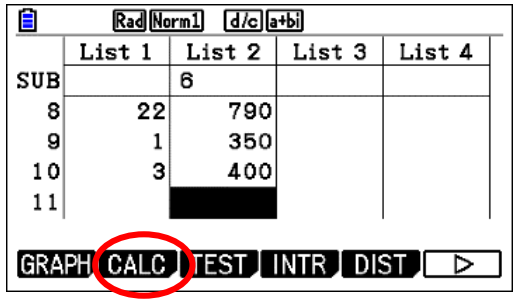
Hours Spent Studying	Math Score
4	390
9	580
10	650
14	730
4	410
7	530
12	600
22	790
1	350
3	400

1. To enter the Statistics mode: MENU 2

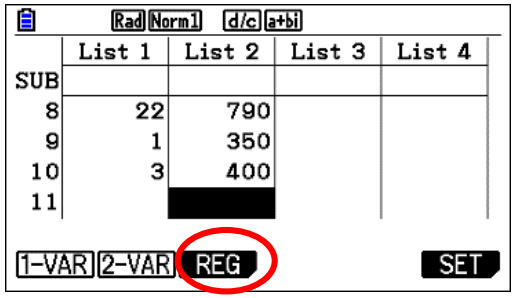


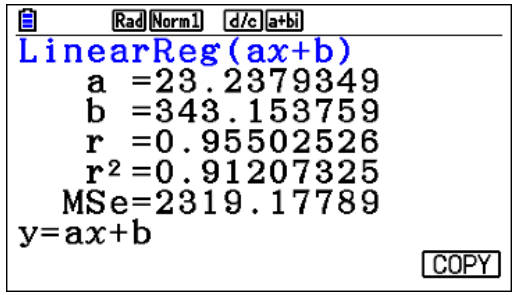


2. Clear old data and enter the new data into the list 1 and 2



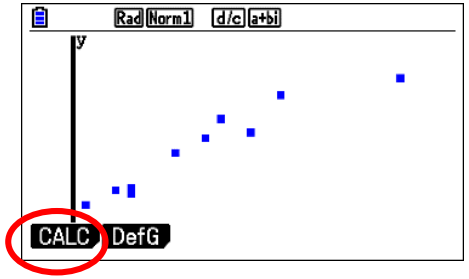
3. Choose Linear Regression Model from CALC F2 F3 F1 F1

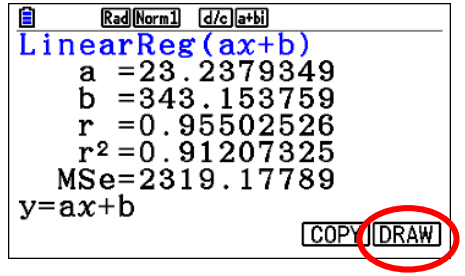


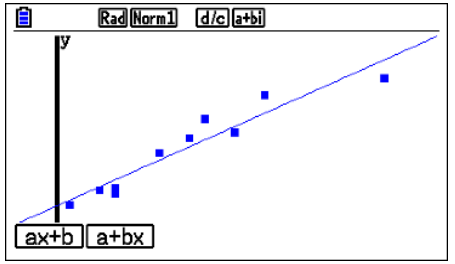


4. Go back (EXIT) and Draw scatter plot from Graph and press F1 (CALC) to select linear regression

F1 F6 ▼ F1 EXIT F1 F1 F2 F1 F6





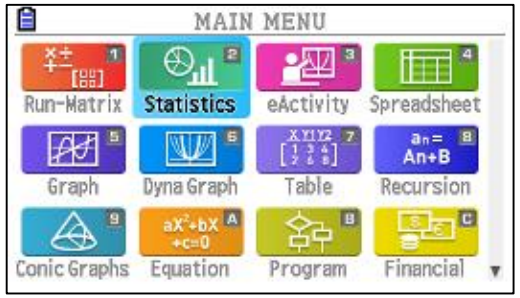


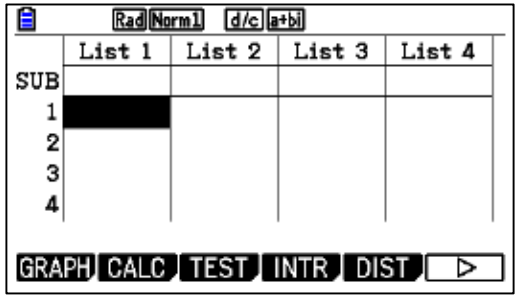
Exponential Regression Model

Use the following table to find the exponential regression

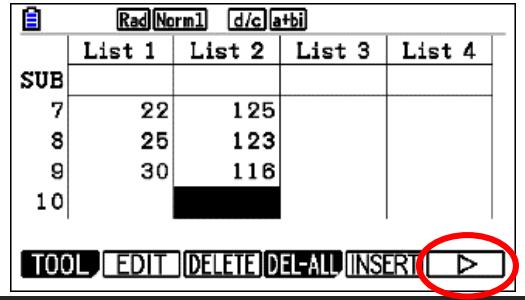
Time (mins)	0	5	8	11	15	18	22	25	30
Temp (F)	179	168	158	149	141	134	125	123	116

1. To enter the Statistics mode: MENU 2



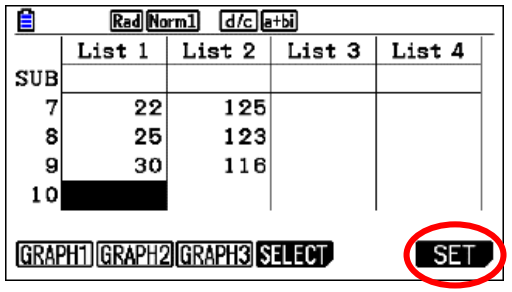


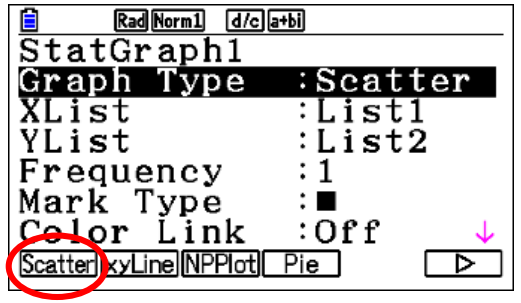
2. Clear old data and enter the new data into the list 1 and 2



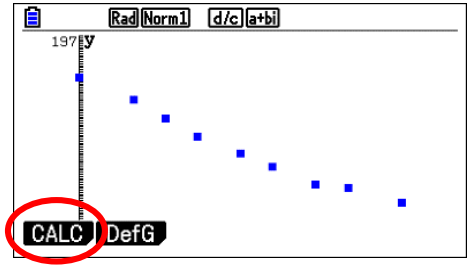
3. Change the functions to see GRAPH by using F6

to create a scatter plot for the data F1 F6 ▼ F1

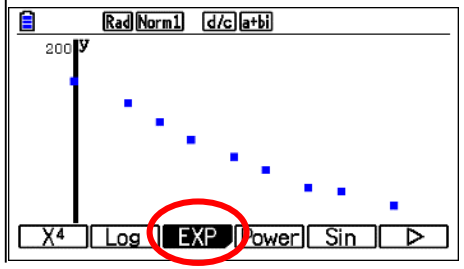


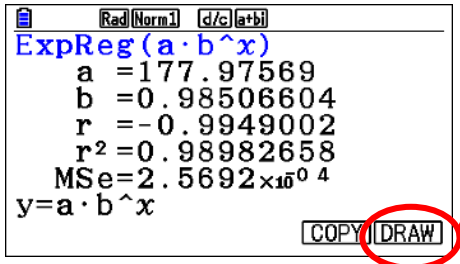


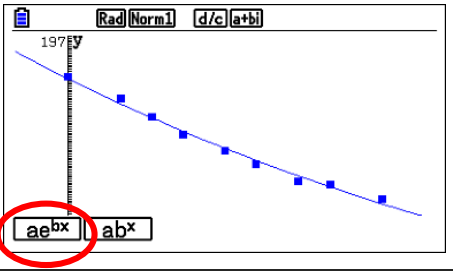
4. Draw scatter plot from Graph and press F1 (CALC) to select regression



5. Draw and find the exponential regression F1 F6 F3 F1 F6





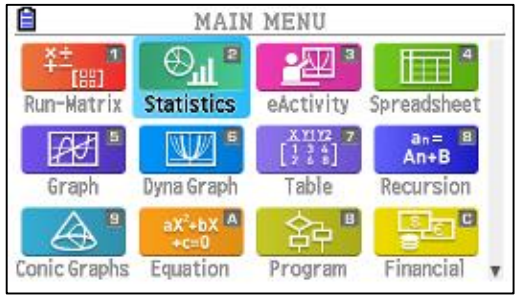


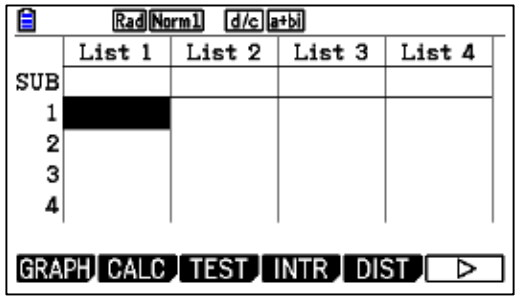
Logarithmic Regression Model Example

Use the following table to find the exponential regression

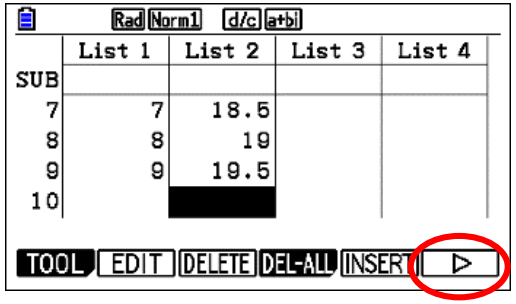
Age of Tree	1	2	3	4	5	6	7	8	9
Height	6	9.5	13	15	16.5	17.5	18.5	19	19.5

1. To enter the Statistics mode: MENU 2



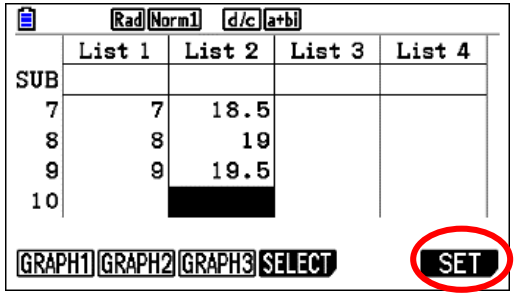


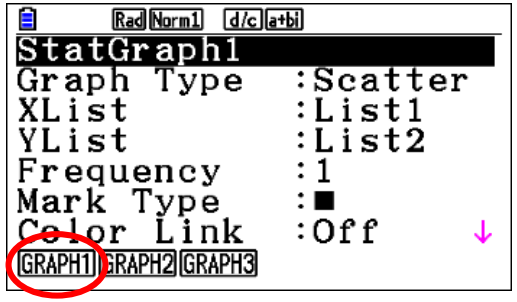
2. Clear old data and enter the new data into the list 1 and 2



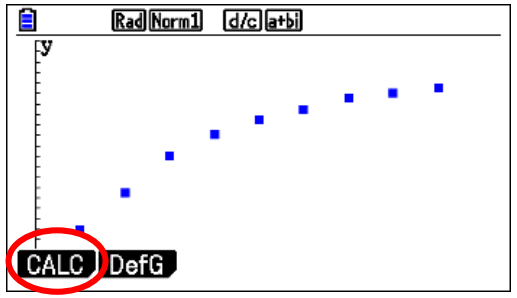
3. Change the functions to see GRAPH by using F6

to create a scatter plot for the data press F1 F6 ▼ F1

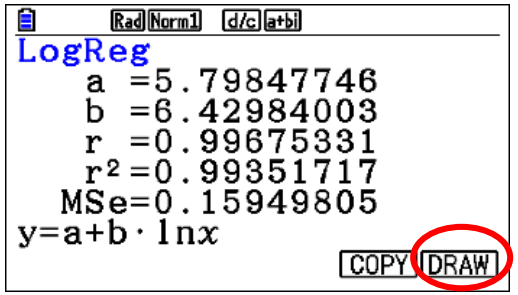


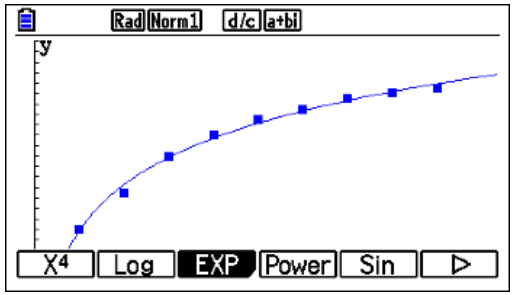


4. Draw scatter plot from Graph EXIT F1



5. Find and draw the logarithm regression F1 F6 F2 F6



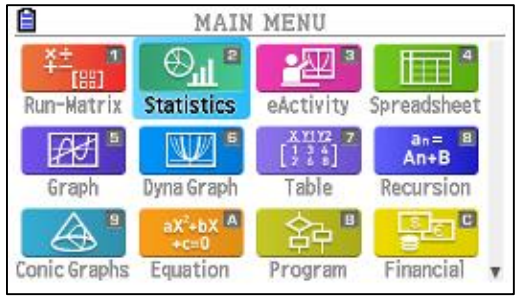


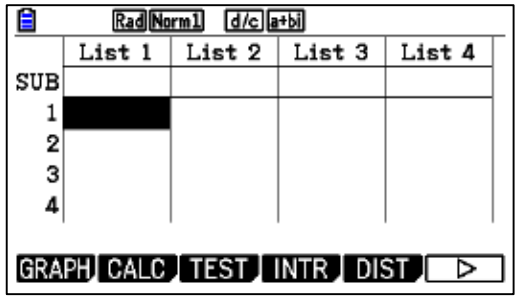
Quadratic Regression Model Example

Use the following table to find the exponential regression

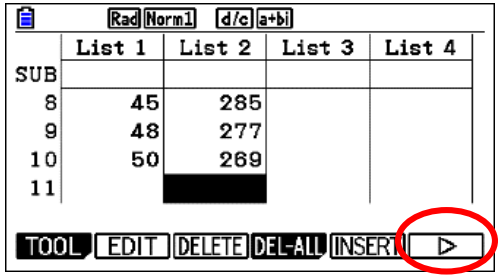
Angle	Distance (feet)
10°	115
15°	157
20°	189
24°	220
30°	253
34°	269
40°	284
45°	285
48°	277
50°	269

1. To enter the Statistics mode: MENU 2



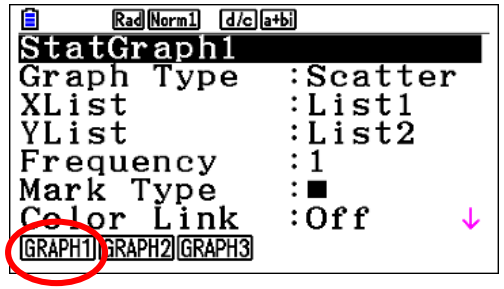


2. Clear old data and enter the new data into the list 1 and 2

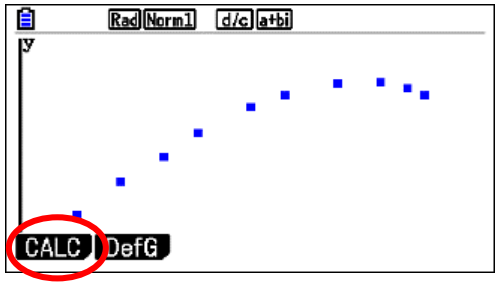


3. Change the functions to see GRAPH by using F6

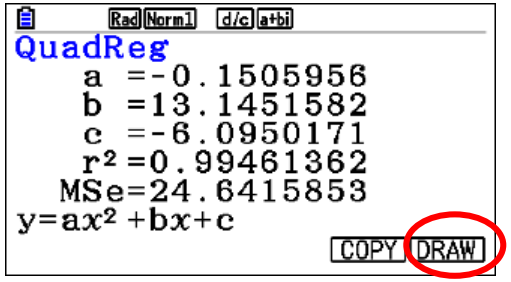
to create a scatter plot for the data F1 F6 ▼ F1

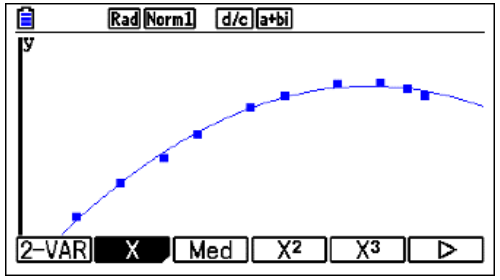


4. Draw scatter plot from Graph EXIT F1



5. Find and draw the Quadratic regression F1 F4 F6





The Distribution functions:

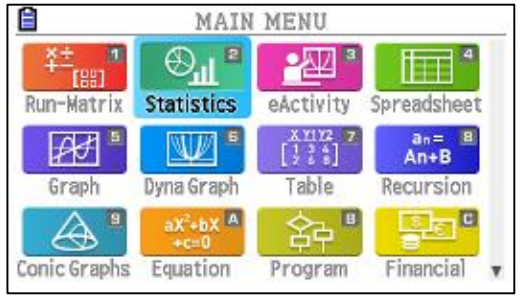
1. ***pdf*** = *Probability Density Function*
   This function returns the probability of a single value of the random variable *x*. Use this to graph a normal curve. Using this function returns the *y*-coordinates of the normal curve.
   normal pdf (x, mean, standard deviation)

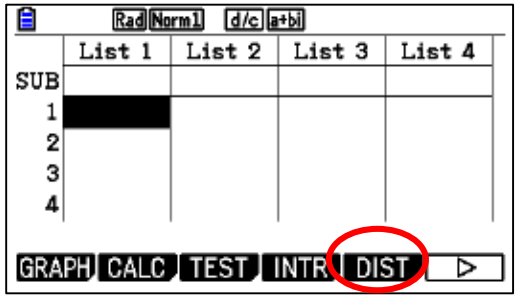
2. ***cdf*** = *Cumulative Distribution Function*
   This function returns the cumulative probability from zero up to some input value of the random variable *x*. Technically, it returns the percentage of area under a continuous distribution curve from negative infinity to the *x*. You can, however, set the lower bound.
   normal cdf (lower bound, upper bound, mean, standard deviation)

3. ***inv*** = *Inverse Normal Probability Distribution Function*
   This function returns the *x*-value given the probability region to the left of the *x*-value.
   ($0 \leq$ area ≤ 1 must be true.) The inverse normal probability distribution function will find the precise value at a given percent based upon the mean and standard deviation.
   invNorm (probability, mean, standard deviation)

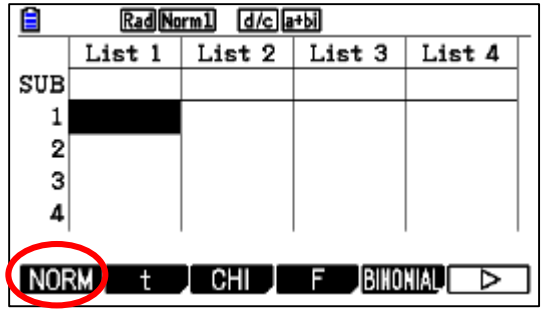
Example :calculate the normal probability density for a specific parameter value when $x = 36$, $\sigma = 2$ and $\mu = 35$.

1. To enter the Statistics mode: MENU 2

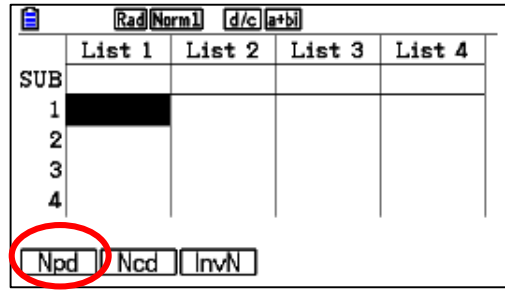




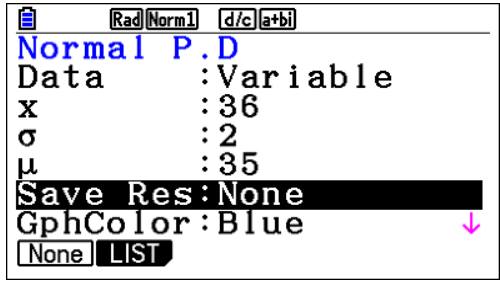
2. Go to (DIST) F5



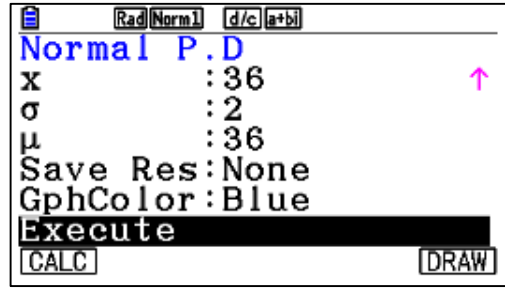
3. Select (NORM) normal distribution F1

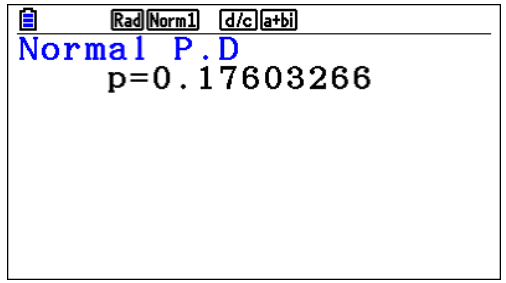


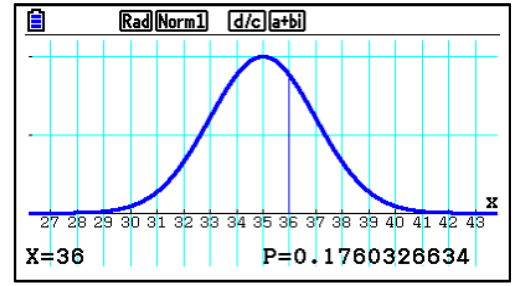
4. Select (Npd) and fill the data F1 F2



5. Use the down arrows to calculate (F1) the Npd and to draw it (F6)



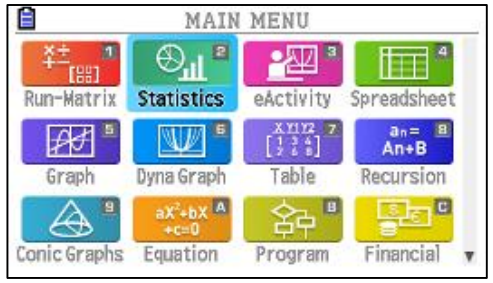


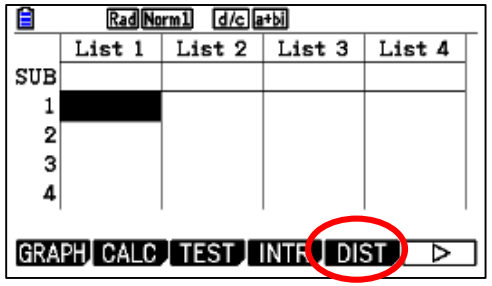


Example: given a normal distribution of values for which the mean is 70 and the standard deviation is 4.5. Find:

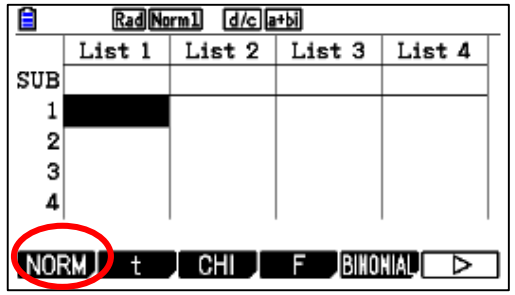
a) the probability that a value is between 65 and 80, inclusive.
b) the probability that a value is greater than or equal to 75.
c) the probability that a value is less than 62.
d) the 90th percentile for this distribution.

1. To enter the Statistics mode: MENU 2



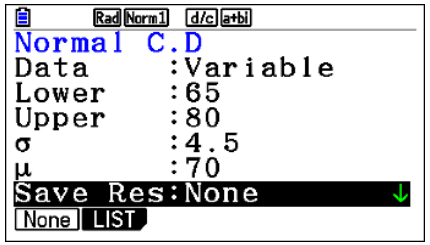


2. Go to (DIST) and select NORM F5 F1

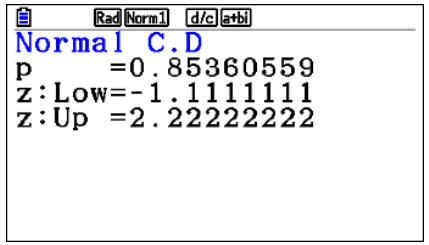


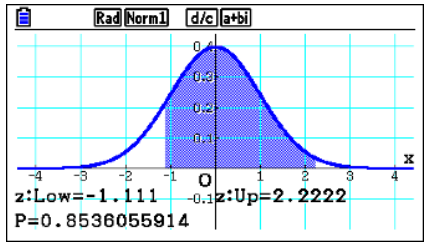
3. Select (Ncd) and fill the data F2

a



4. Use the down arrows to calculate the Npd and to draw it



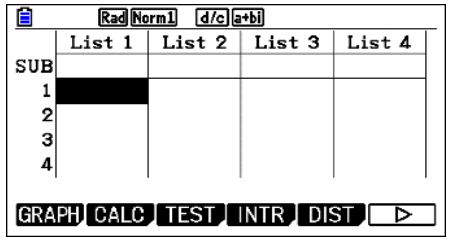


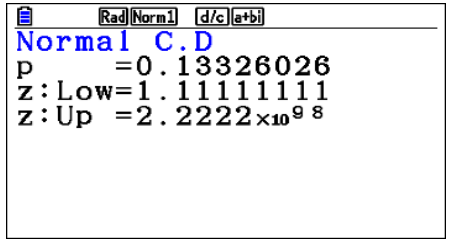
The upper boundary in this problem will be positive infinity. Type 10^99 to represent positive infinity

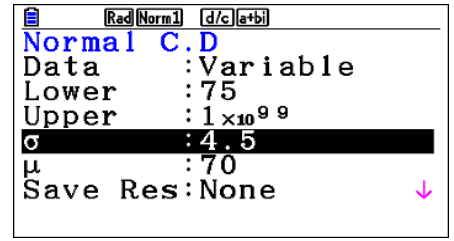
b

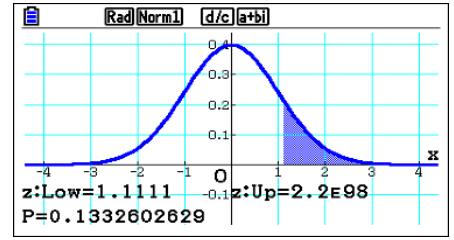
5. Use (EXIT) to go back again to same situation and refill the data

EXIT ▲ ▲ ▲ ▲ 7 5 EXE 1 x10^x 9 9 EXE EXE EXIT ▼ ▼ ▼ ▼ F6









Example: given a normal distribution of values for which the mean is 70 and the standard deviation is 4.5. Find:

a) the probability that a value is between 65 and 80, inclusive.
b) the probability that a value is greater than or equal to 75.
c) the probability that a value is less than 62.
d) the 90th percentile for this distribution.

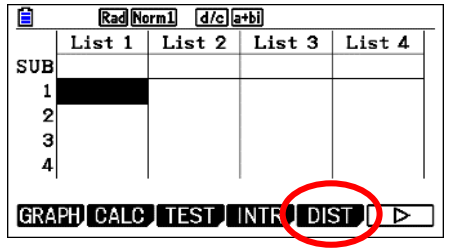
c

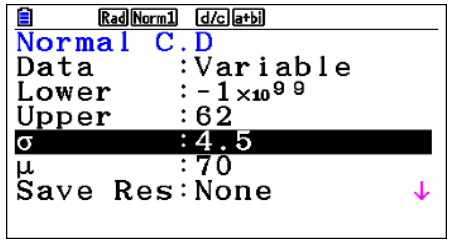
The lower boundary in this problem will be negative infinity -1×10^{99}

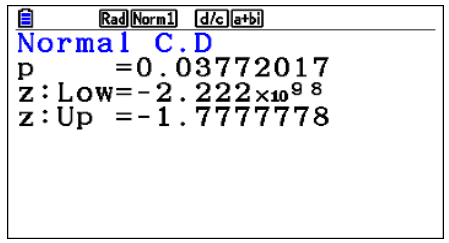
6. Use (EXIT) to go back again to same situation and refill the data

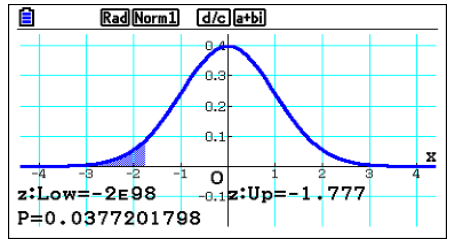
EXIT ▲ ▲ (−)

1 ×10^x 9 9 EXE 6 2 EXE EXE EXIT ▼ ▼ ▼ ▼ F6







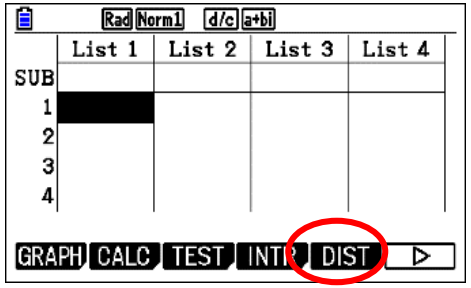


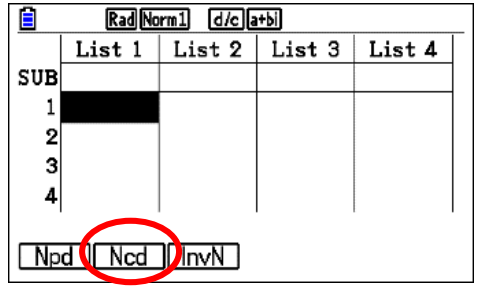
d

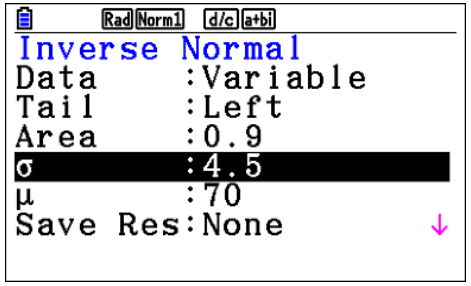
Given a probability region to the left of a value determine the value using invNorm.

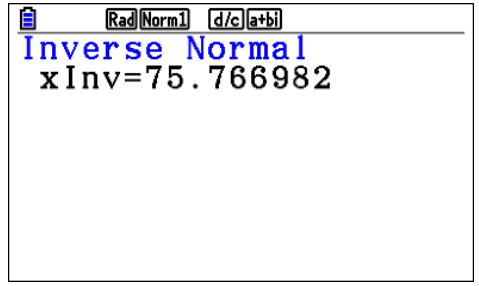
7. Use (EXIT) to go back again to same situation and refill the data

EXIT EXIT F5 F1 F3 ▼ ▼ 0 • 9 EXE EXE





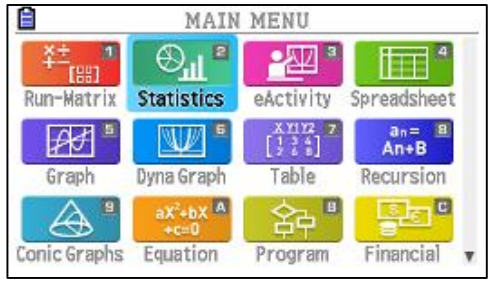


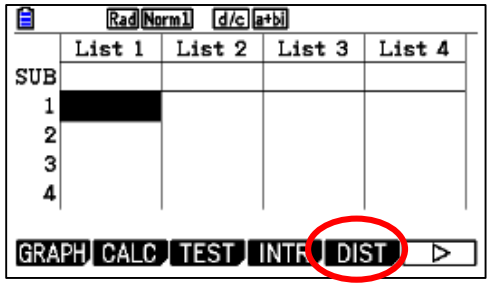


T - Distribution

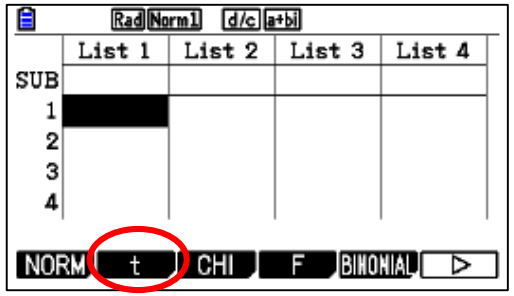
Example: calculate Student-*t* probability density for a specific parameter value when *x* = 1 and degrees of freedom = 2.

1. To enter the Statistics mode: MENU 2

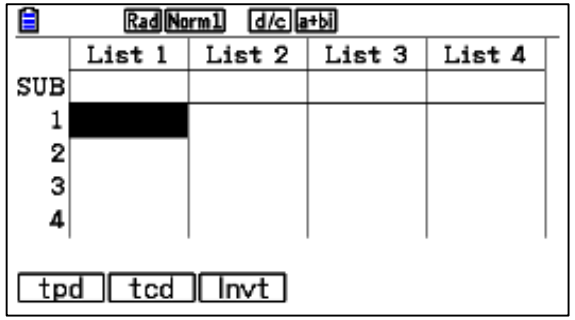




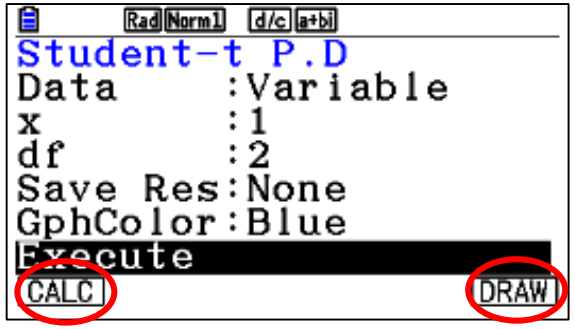
2. Go to (DIST) and select T F5 F2



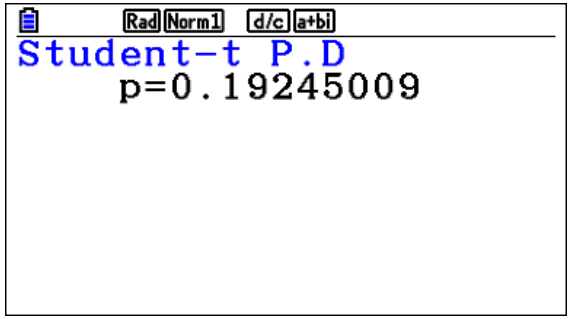
3. Select (Tpd) distribution F1 F2

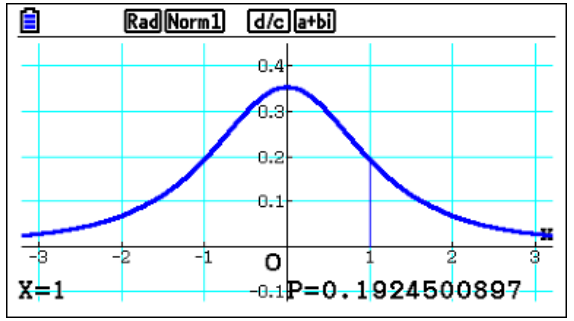


4. Fill the data



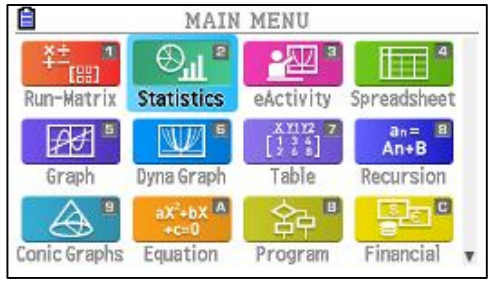
5. Use the down arrows to calculate (F1) the Tpd and to draw it (F6)

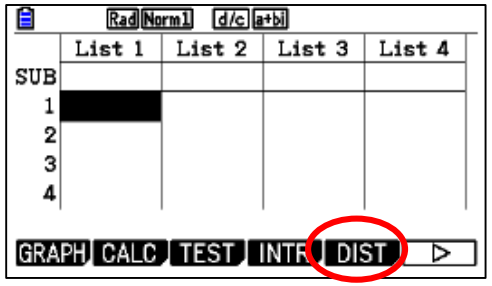




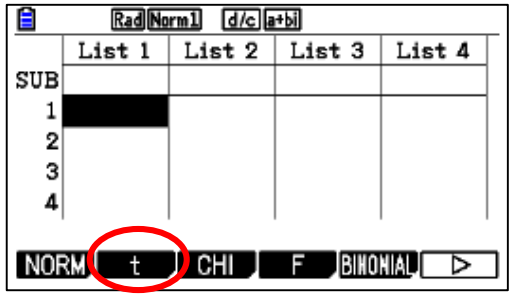
Example: calculate Student-*t* distribution probability for a specific parameter value, we will calculate Student-*t* distribution probability when lower boundary = –2, upper boundary = 3, and degrees of freedom = 18 **.**

1. To enter the Statistics mode: MENU 2

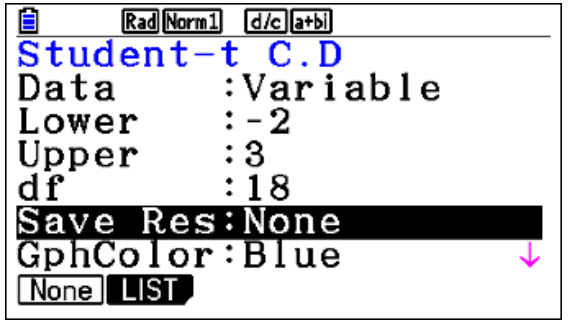




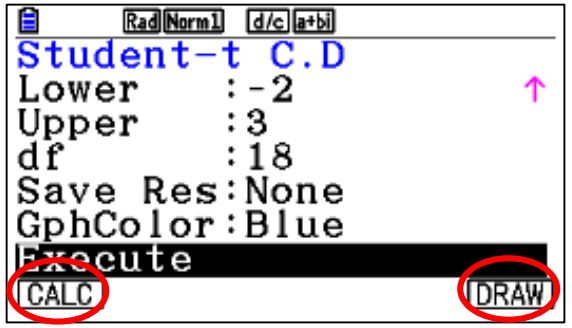
2. Go to (DIST) and select T F5 F2



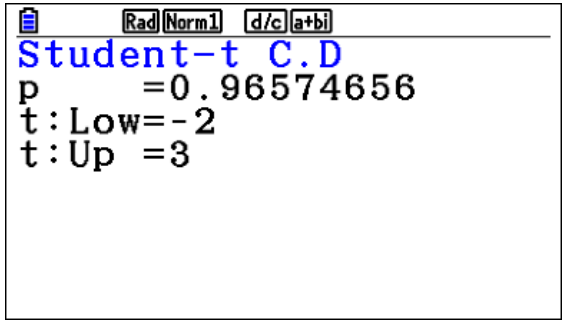
3. Select (Tcd) distribution F2 F2

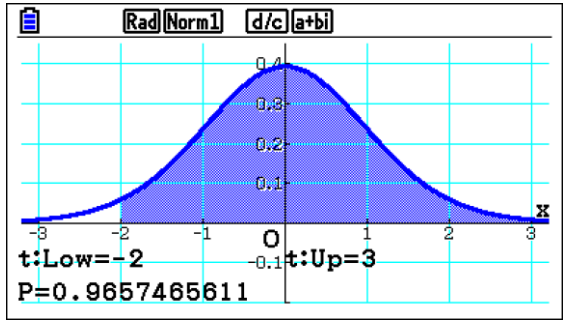


4. Fill the data



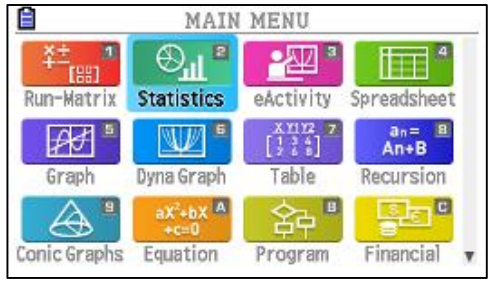
5. Use the down arrows to calculate (F1) the Tcd and to draw it (F6)

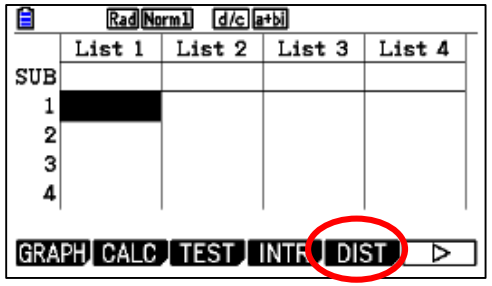




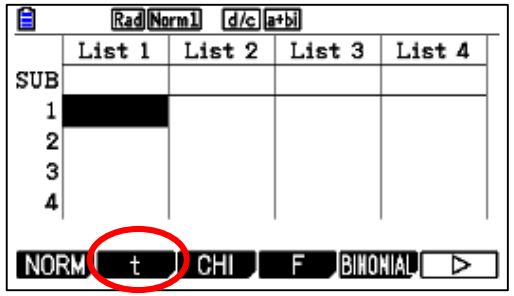
Example: Find the area under a T curve with degrees of freedom 10 for P(1 ≤ X ≤ 2).

1. To enter the Statistics mode: MENU 2

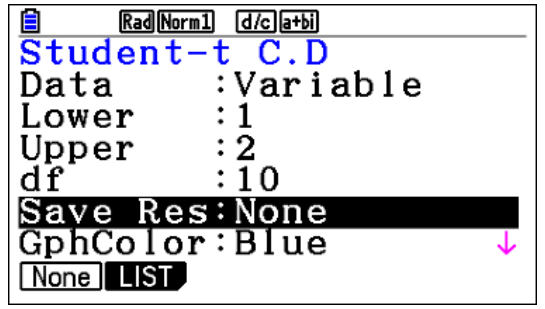




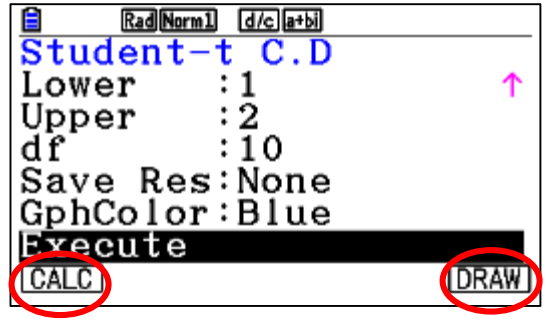
2. Go to (DIST) and select T F5 F2



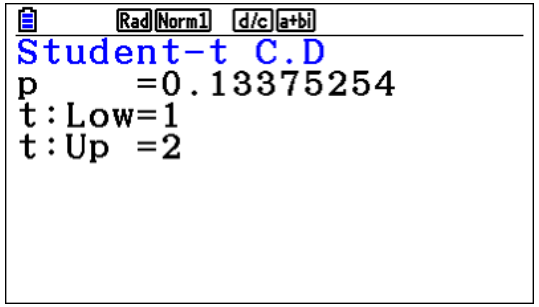
3. Select (Tcd) distribution F2 F2

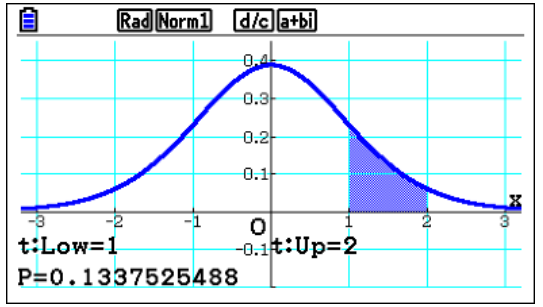


4. Fill the data



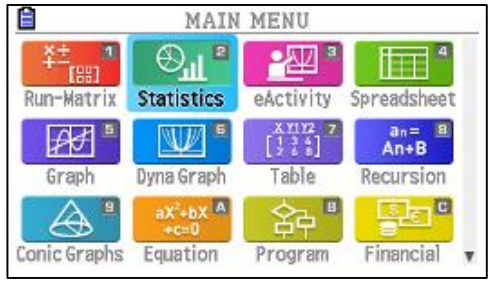
5. Use the down arrows to calculate (F1) the Tcd and to draw it (F6)

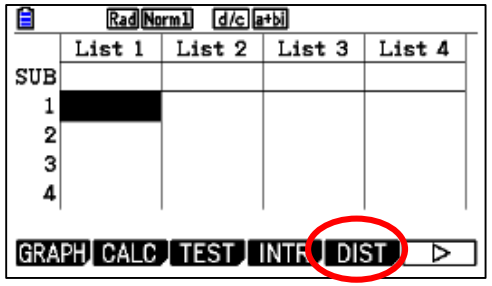




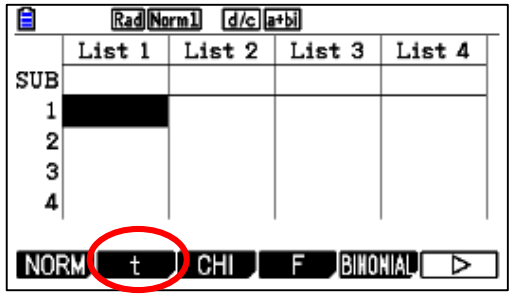
Example: find the T score with a value of 0.25 to the left and df of 10.

1. To enter the Statistics mode: MENU 2

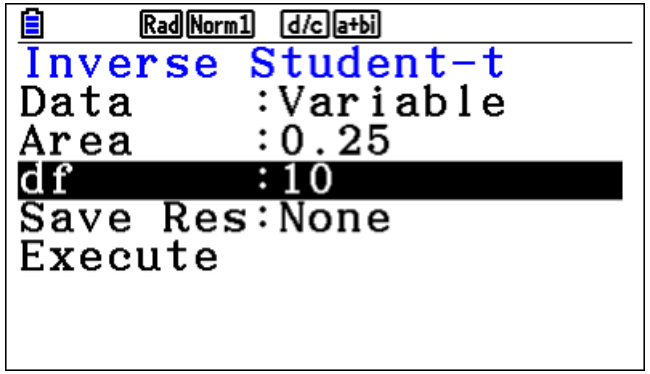




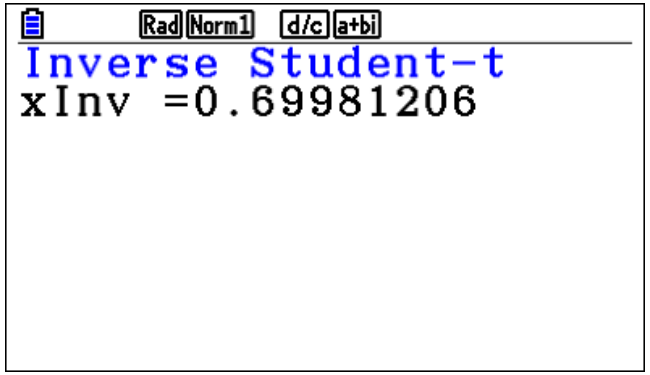
2. Go to (DIST) and select T F5 F2



3. Select (Invt) distribution and fill the data F3



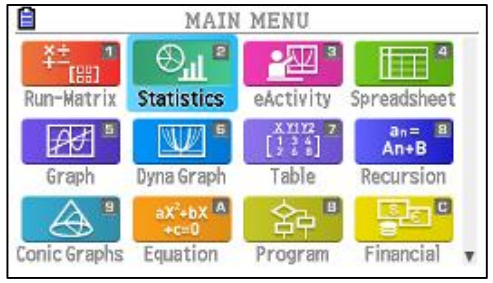
4. Use the down arrows to calculate (F1) or press EXE

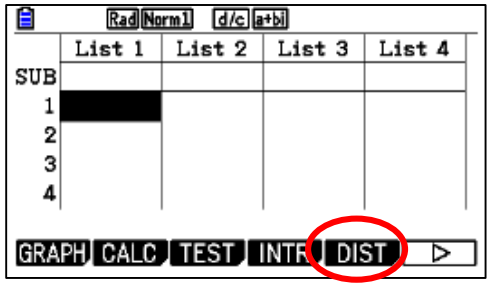


Chi-square Distribution

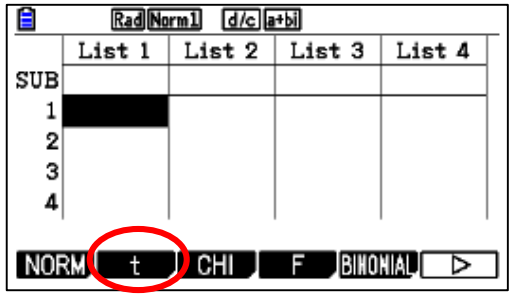
Example: calculate χ^2 probability density for a specific parameter value, we will calculate χ^2 probability density when x = 1 and degrees of freedom = 3.

1. To enter the Statistics mode: MENU 2

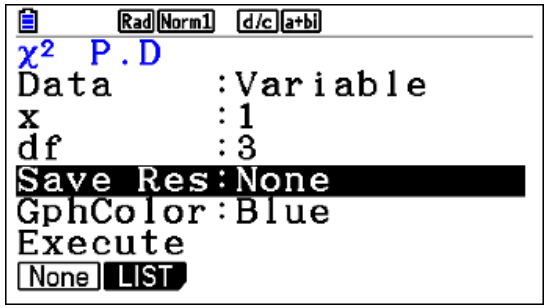




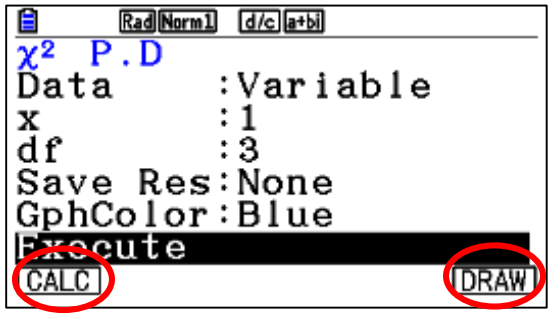
2. Go to (DIST) and select CHI F5 F3



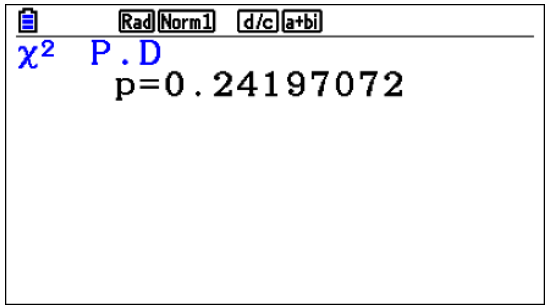
3. Select (Cpd) distribution F1

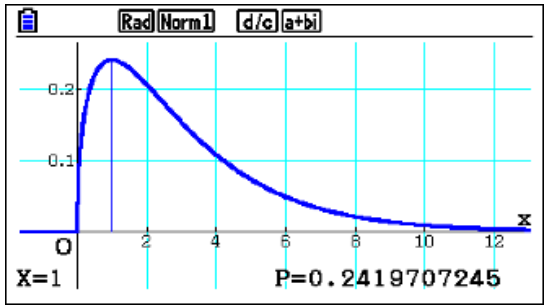


4. Fill the data



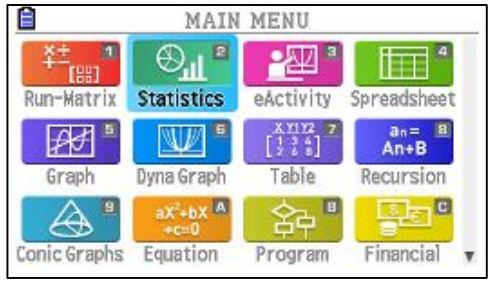
5. Use the down arrows to calculate (F1) the Tcd and to draw it (F6)

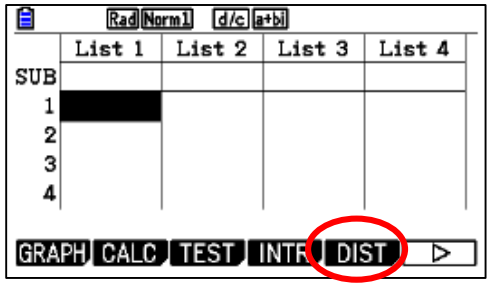




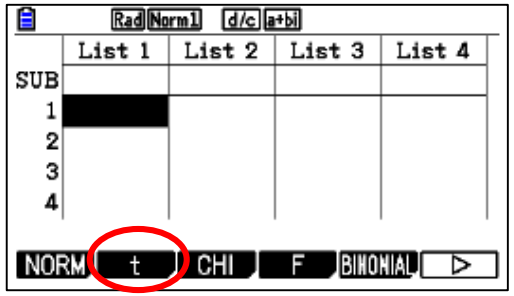
Example: calculate χ^2 distribution probability for a specific parameter value, we will calculate χ^2 distribution probability when lower boundary = 0, upper boundary = 19.023, and degrees of freedom = 9.

1. To enter the Statistics mode: MENU 2

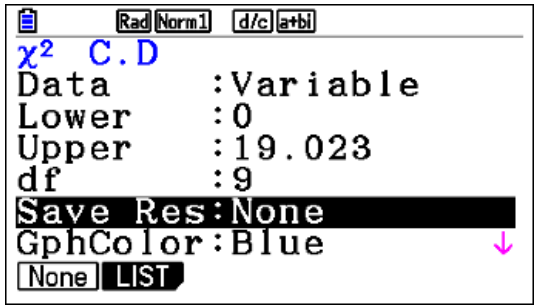




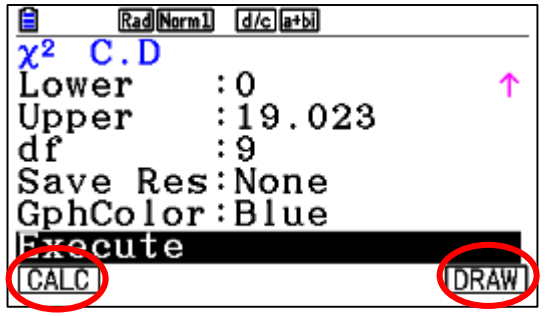
2. Go to (DIST) and select CHI F5 F3



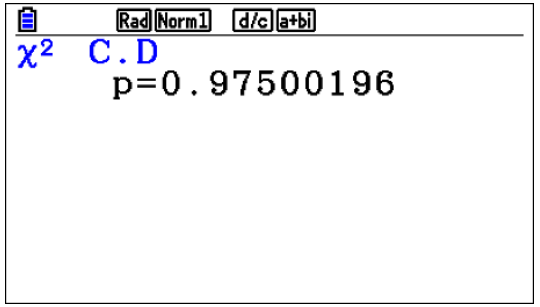
3. Select (Ccd) distribution F2

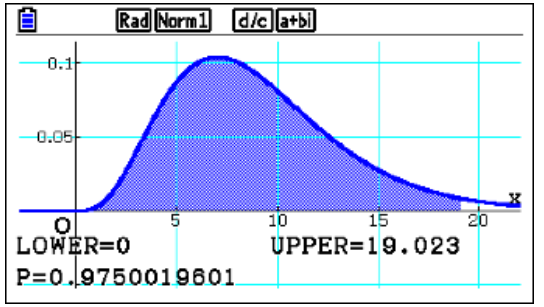


4. Fill the data



5. Use the down arrows to calculate (F1) the Tcd and to draw it (F6)



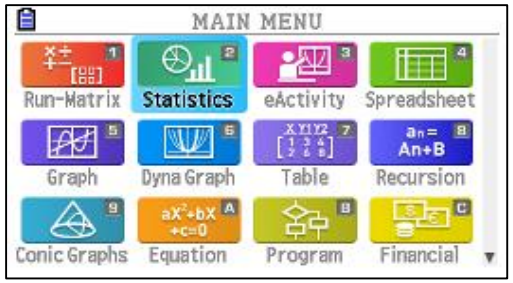


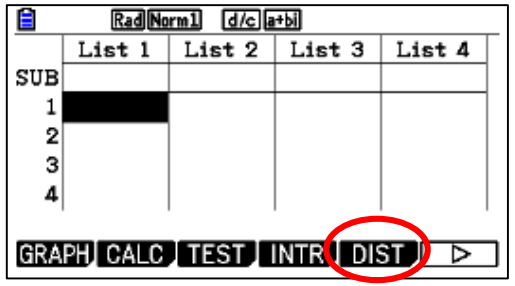
F- distribution probability

F distribution probability calculates the probability of *F* distribution data falling between two specific values.

Example: calculate *F* distribution probability for a specific parameter value, we will calculate *F* distribution probability when lower boundary = 0, upper boundary = 1.9824, *n-df* = 19 and *d-df* = 16.

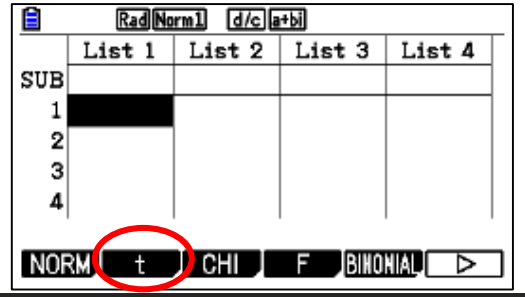
1. To enter the Statistics mode: MENU 2



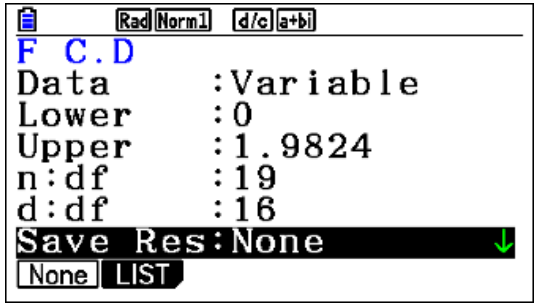


2. Go to (DIST) and select CHI

F5 F4

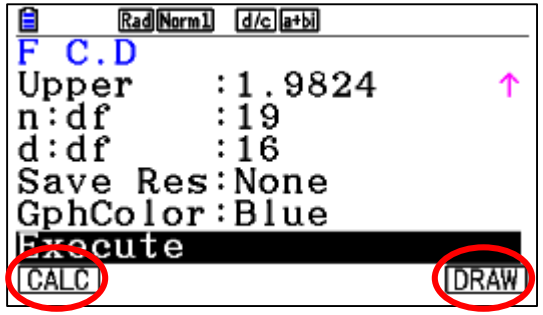


3. Select (Ccd) distribution F2

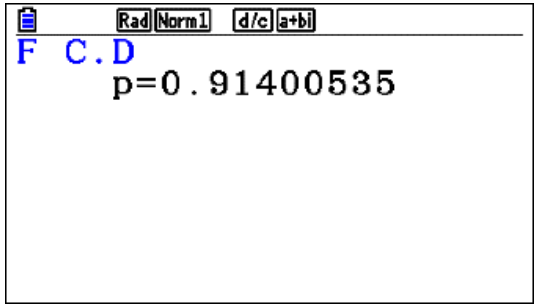


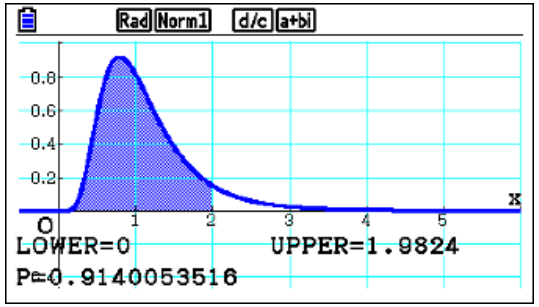
4. Fill the data

numerator degrees of freedom
denominator degrees of freedom



5. Use the down arrows to calculate (F1) the Tcd and to draw it (F6)





Binomial probability

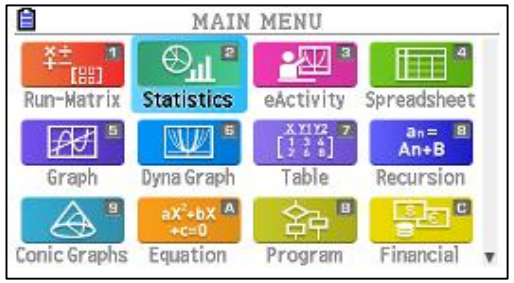
Binomial probability calculates a probability at specified value for the discrete binomial distribution with the specified number of trials and probability of success on each trial.

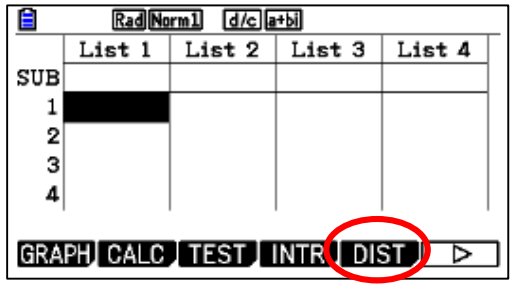
Example: A six-sided die is rolled twelve times and the number of sixes rolled is counted.

a) What is the probability of rolling exactly two sixes?
b) What is the probability of rolling more than two sixes?

This number of sixes can be modelled as a binomial distribution: x ~ B (12, $\frac{1}{6}$).

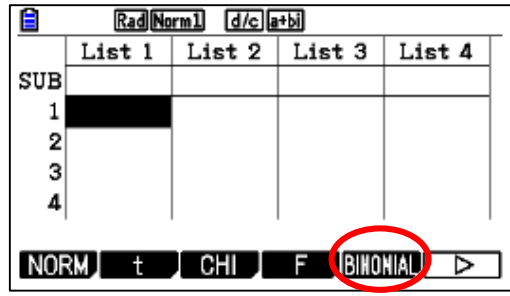
1. To enter the Statistics mode: MENU 2



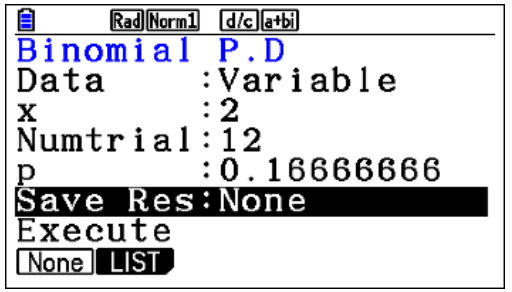


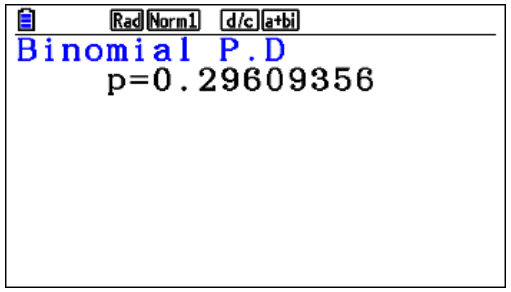
2. Go to (DIST) and select Binomial

F5 F5



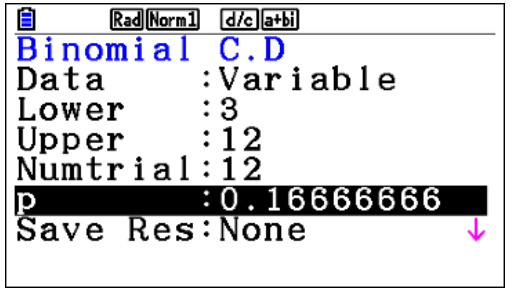
3. Select (Bpd) distribution F1 fill the data and press EXE

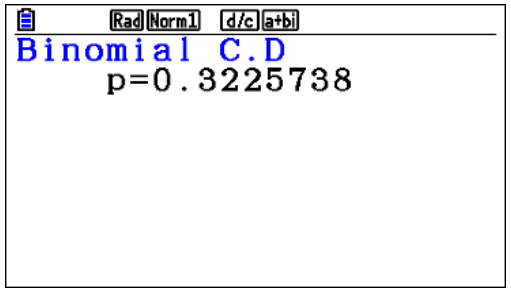




4. b) Find P (x1 ≤ X ≤ x2) using Bcd

Use (EXIT) to go back again to same situation select Bcd and refill the data





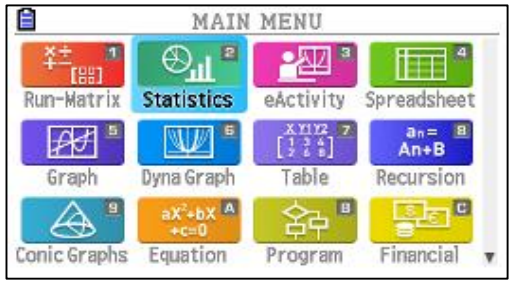
Poisson probability

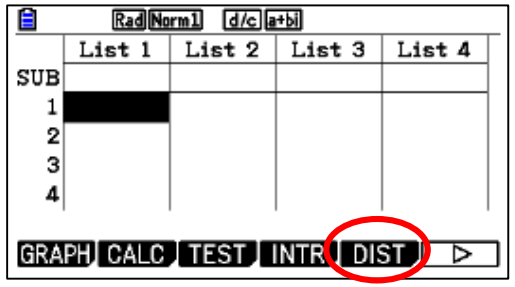
Poisson probability calculates a probability at specified value for the discrete Poisson distribution with the specified mean.

Example: Customers enter a shop at an average of three per minute. The number of customers entering the shop in a given minute can be modelled by a Poisson distribution: X ~ P(3)

a) What is the probability of exactly **one** customer entering the shop in a minute?
b) What is the probability of **five** or fewer customers entering the shop in a minute?

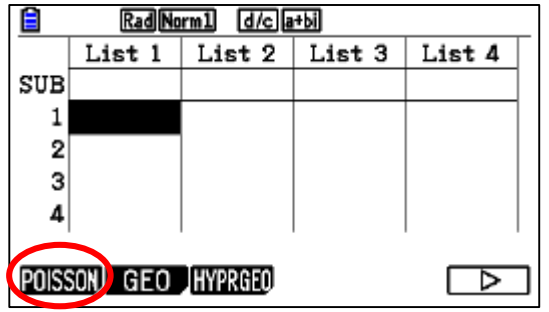
1. To enter the Statistics mode: MENU 2



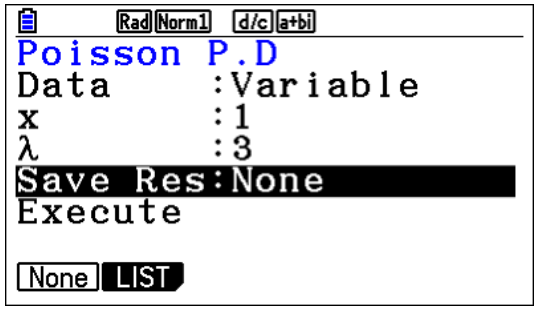


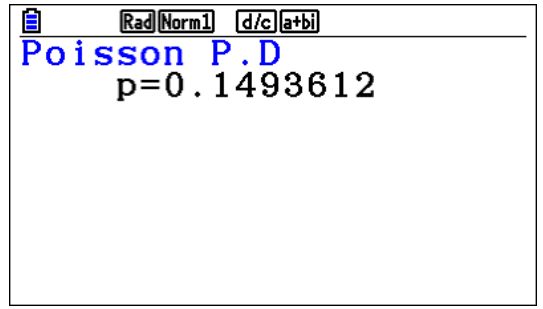
2. Go to (DIST) and select Poisson

F5 F6 F1 F1

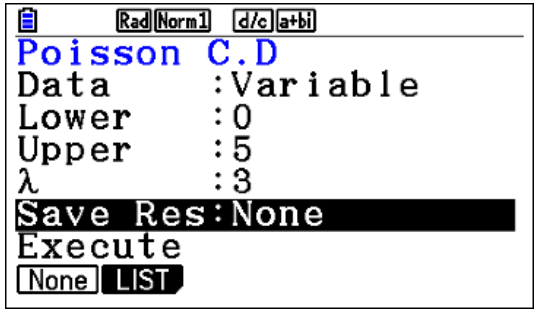


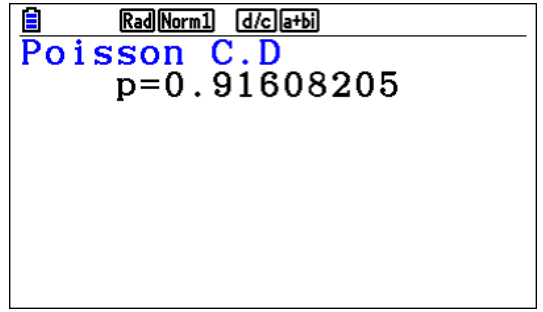
a) Find P(X=x) using **Ppd** (fill the data and press EXE).





b) Use (EXIT) to go back again to same situation select Pcd and refill the data





1-Sample Z Test: tests for the unknown population mean when the population standard deviation is known.

2-Sample Z Test: tests the equality of the means of two populations based on independent samples when both population standard deviations are known.

1-Prop Z Test: tests for an unknown proportion of successes.

2-Prop Z Test: tests to compare the proportion of successes from two populations.

1-Sample t Test: tests the hypothesis for a single unknown population mean when the population standard deviation is unknown.

2-Sample t Test: compares the population means when the population standard deviations are unknown.

Linear Reg t Test: calculates the strength of the linear association of paired data.

The χ^2 test, a number of independent groups are provided, and a hypothesis is tested relative to the probability of samples being included in each group.

The χ^2 GOF test (χ^2one-way Test): tests whether the observed count of sample data fits a certain distribution. For example, it can be used to determine conformance with normal distribution or binomial distribution.

The χ^2 two-way test: creates a cross-tabulation table that structures mainly two qualitative variables (such as “Yes” and “No”), and evaluates the independence of the variables.

2-Sample F Test: tests the hypothesis for the ratio of sample variances. It could be used, for example, to test the carcinogenic effects of multiple suspected factors such as tobacco use, alcohol, vitamin deficiency, high coffee intake, inactivity, poor living habits, etc.

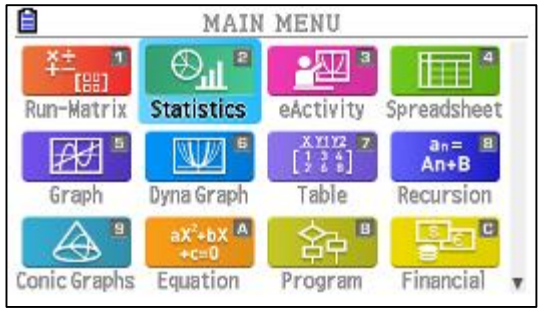
One-Way ANOVA: is used when there is one independent variable and one dependent variable.

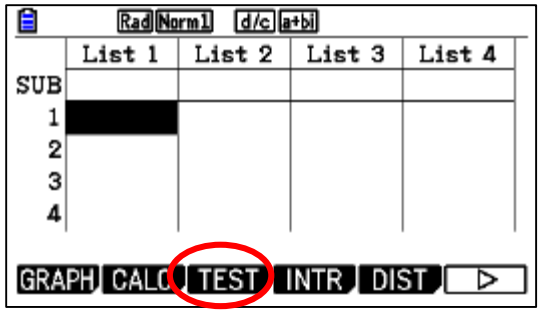
Two-Way ANOVA: is used when there are two independent variables and one dependent variable

1-Sample Z test

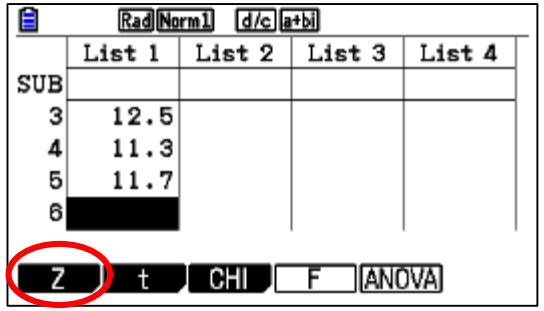
Example: Perform a 1-Sample *Z* Test for one list of data m < m0 test for the data List1 = {11.2, 10.9, 12.5, 11.3, 11.7}, when μ = 11.5 and s = 3.

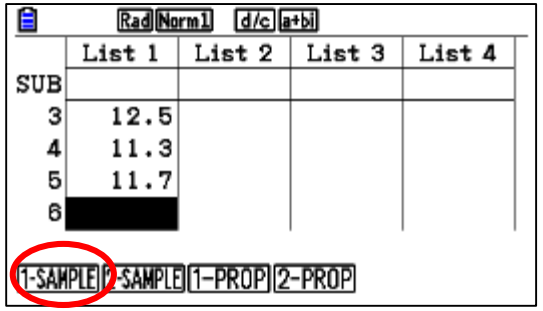
1. To enter the Statistics mode: MENU 2



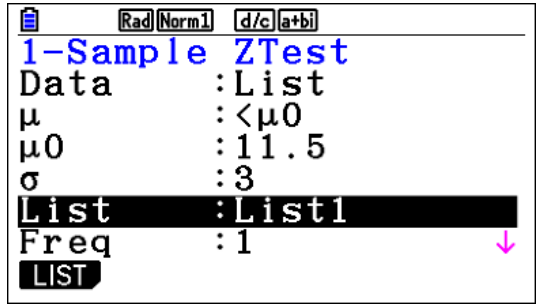


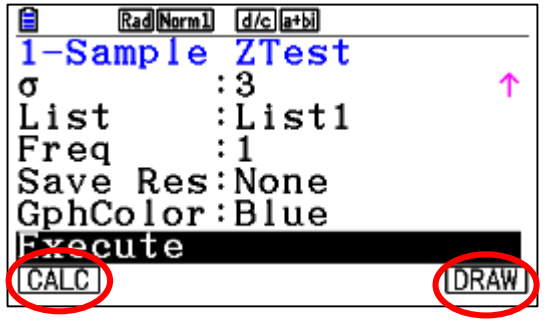
2. Go to (TEST) and select Z, 1-sample F3 F1 F1



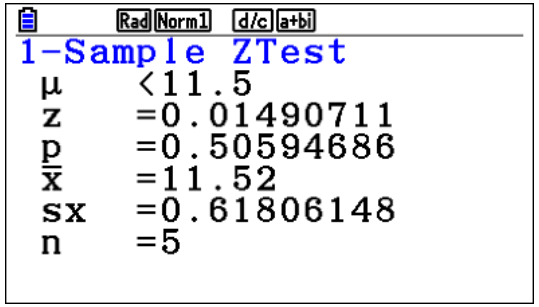


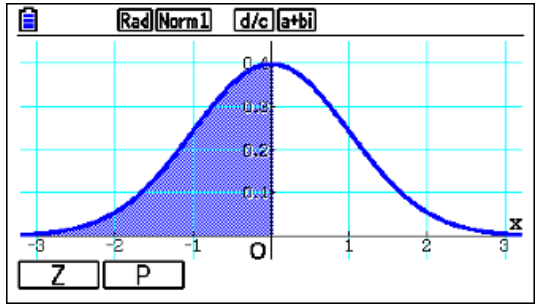
3. Fill the data





4. Use the down arrows to calculate (F1) and to draw (F6)

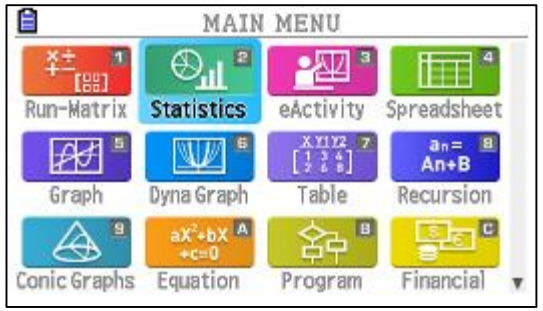


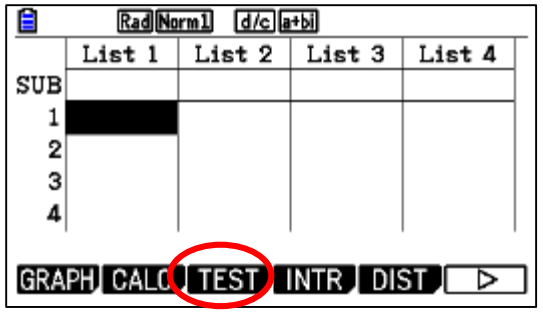


2-Sample Z test

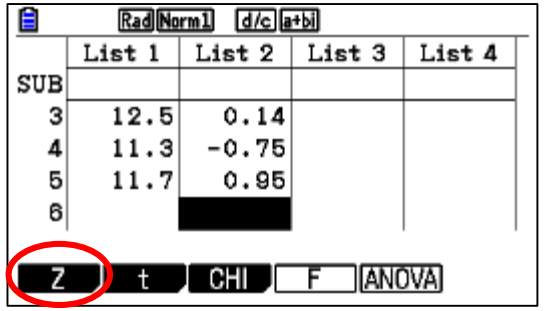
Example: Perform a 2-Sample *Z* Test when two lists of data are input, we will perform m1 < m2 test for the data List1 = {11.2, 10.9, 12.5, 11.3, 11.7} and List2 = {0.84, 0.9, 0.14, –0.75, –0.95}, when s1 = 15.5 and s2 = 13.5.

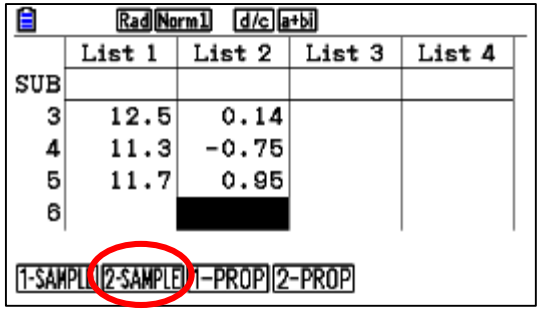
1. To enter the Statistics mode clear old data and fill the new: MENU 2



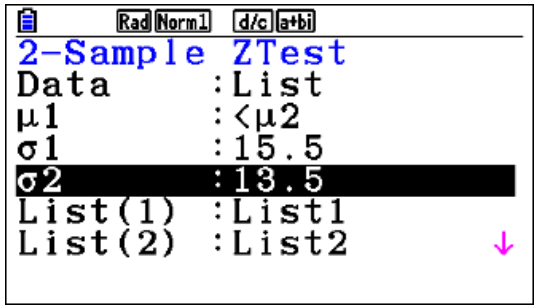


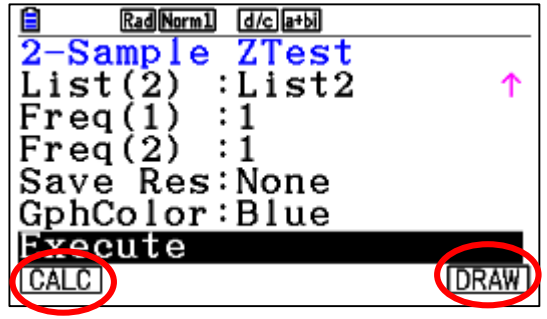
2. Go to (TEST) and select Z, 2-sample F3 F1 F2



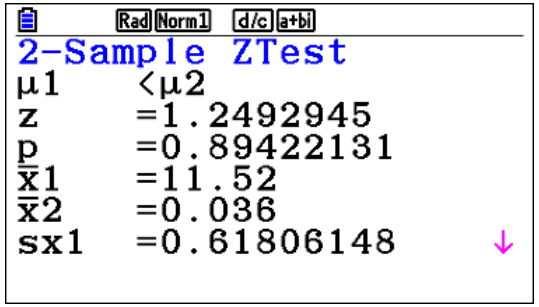


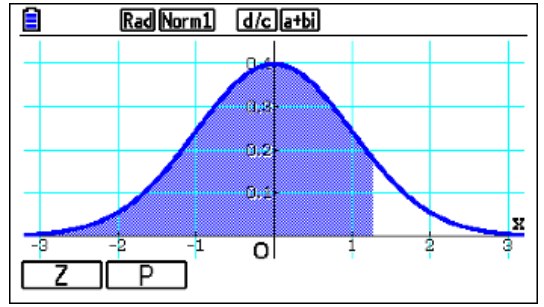
3. Fill the required data





4. Use the down arrows to calculate (F1) and to draw (F6)

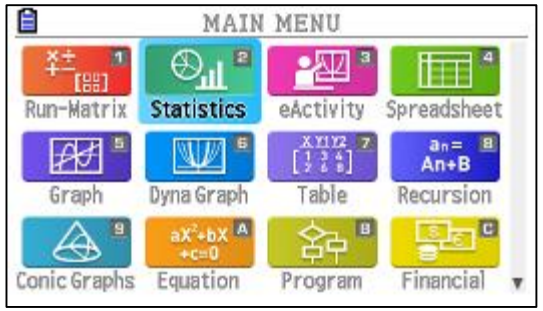


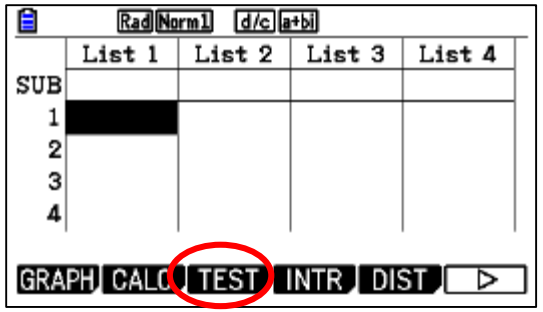


1-Prop Z test

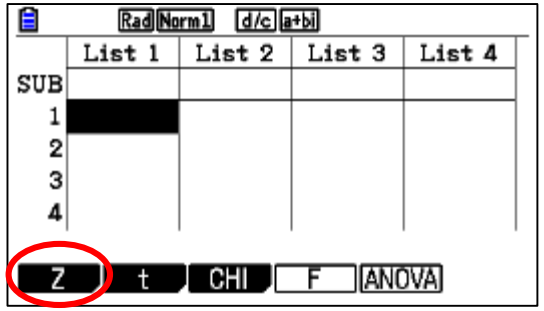
Example: To perform a 1-Prop *Z* Test for specific expected sample proportion, data value, and sample size Perform the calculation using: $p0 = 0.5$, $x = 2048$, $n = 4040$.

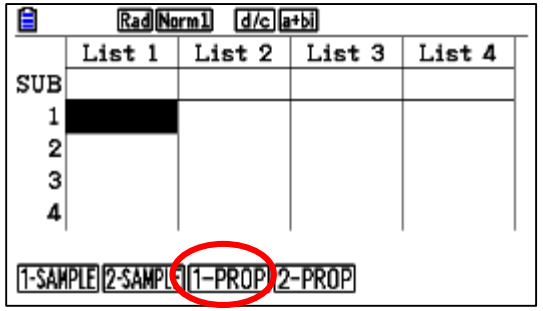
1. To enter the Statistics mode and clear old data : MENU 2



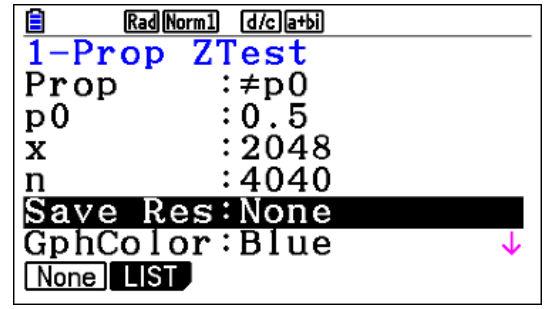


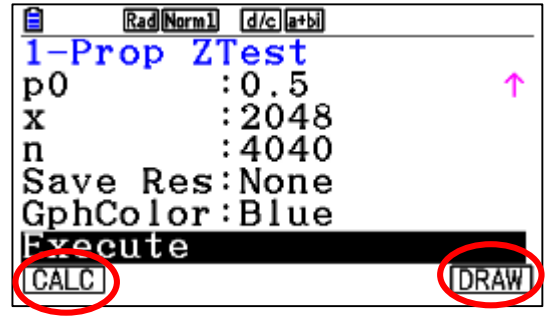
2. Go to (TEST) and select Z, 1-Prob F3 F1 F3



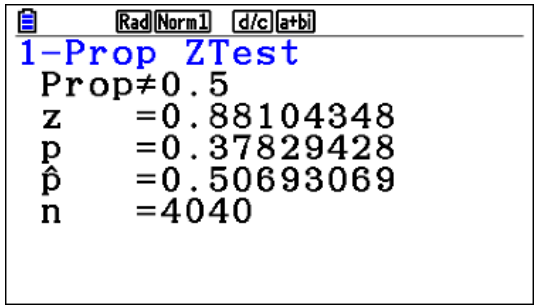


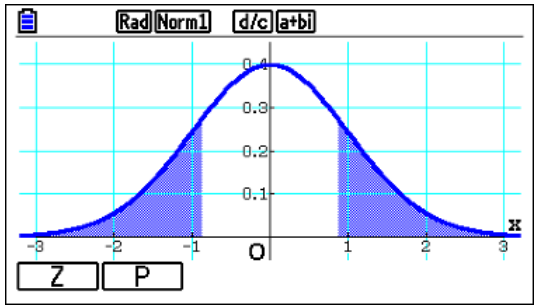
3. Fill the required data





4. Use the down arrows to calculate (F1) and to draw (F6)

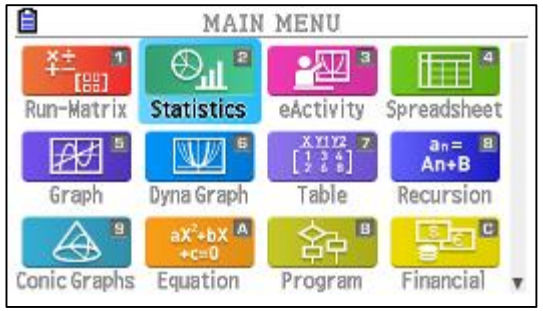


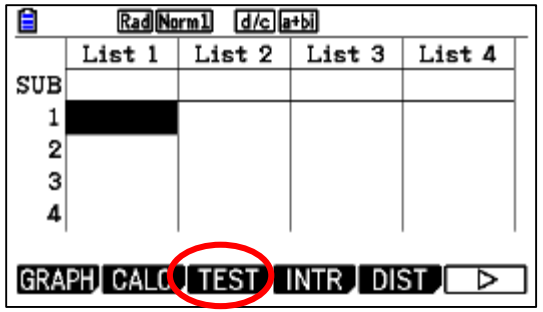


2-Prop Z test

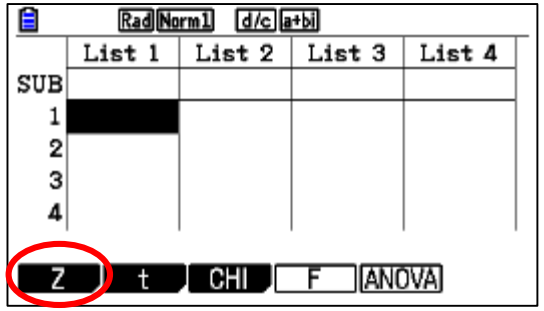
Example: To perform a $p1 > p2$ 2-Prop Z Test for expected sample proportions, data values, and sample sizes Perform a $p1 > p2$ test using: $x1 = 225$, $n1 = 300$, $x2 = 230$, $n2 = 300$.

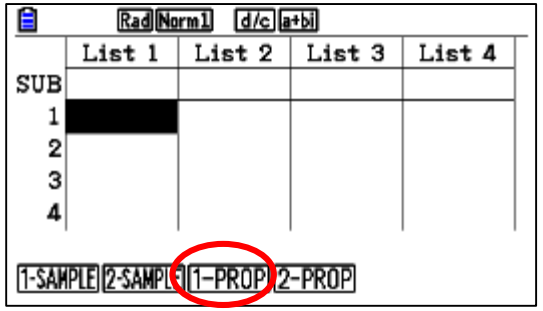
1. To enter the Statistics mode and clear old data : MENU 2



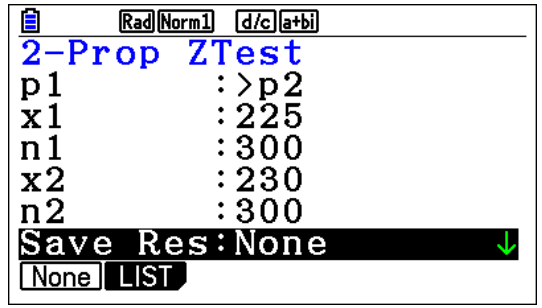


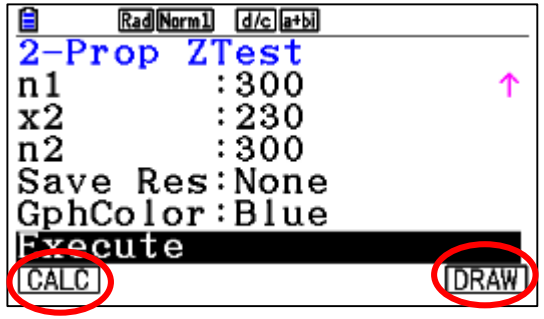
2. Go to (TEST) and select Z, 2-Prop F3 F1 F4



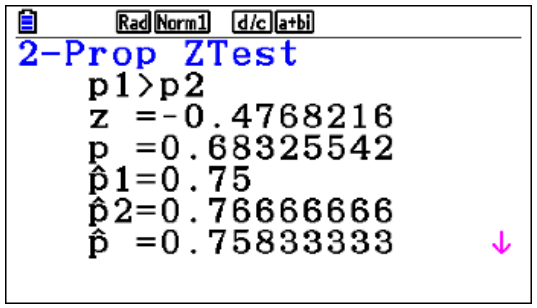


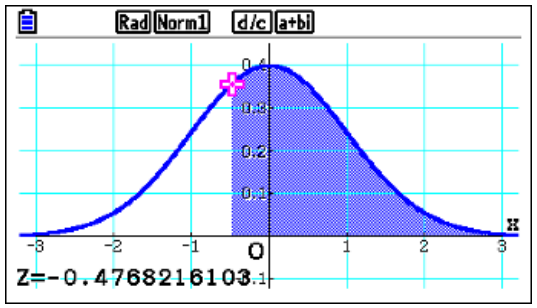
3. Fill the required data





4. Use the down arrows to calculate (F1) and to draw (F6)

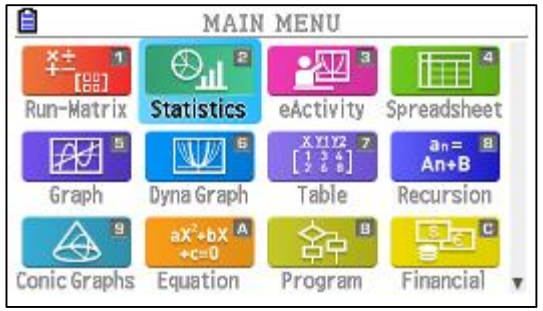


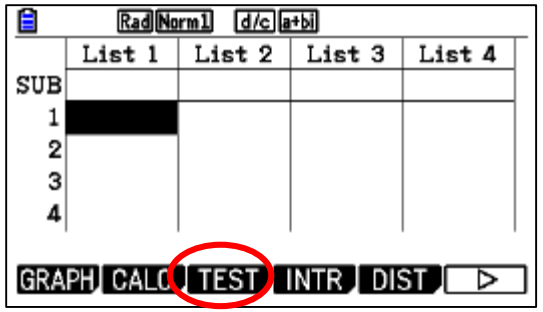


1-Sample T test

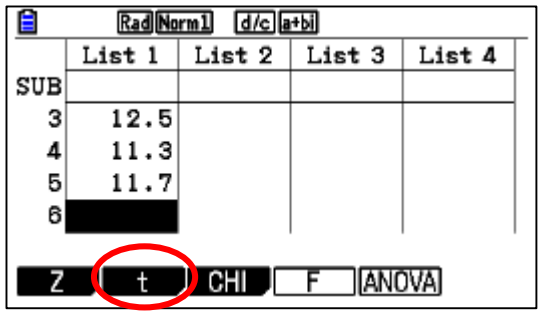
Example: Perform a 1-Sample *t* Test for one list of data where m ≠ m0 , List1 = {11.2, 10.9, 12.5, 11.3, 11.7}, when m0 = 11.3.

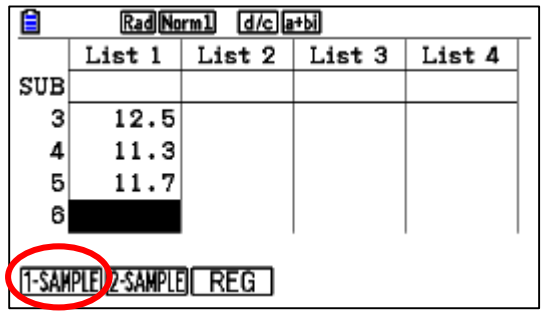
1. To enter the Statistics mode and clear old data : MENU 2



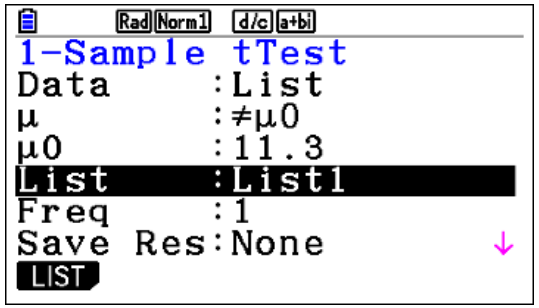


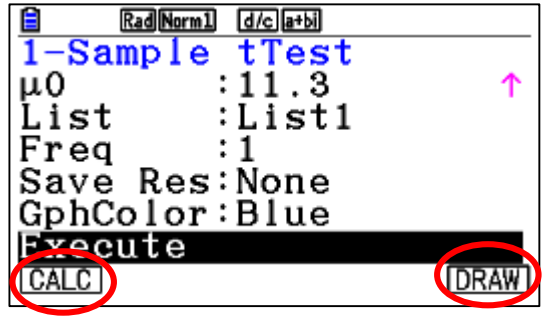
2. Fill the data and go to (TEST) and select T, 1-sample F3 F2 F1



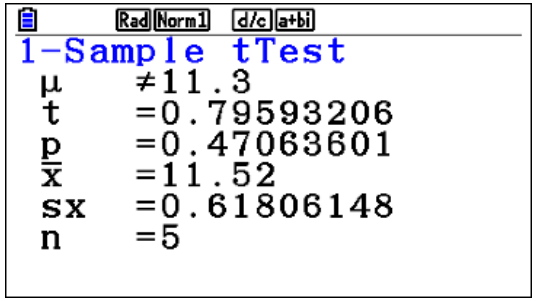


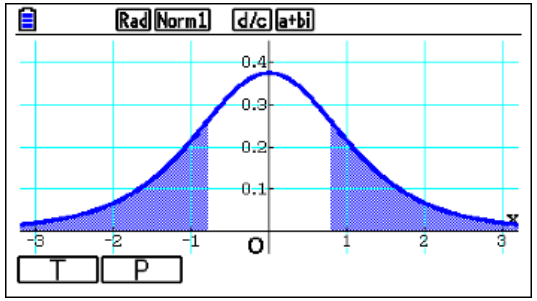
3. Fill the required data





4. Use the down arrows to calculate (F1) and to draw (F6)

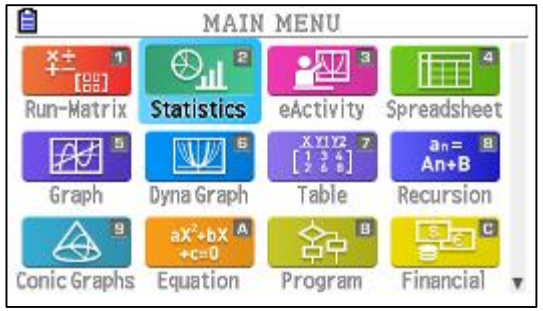


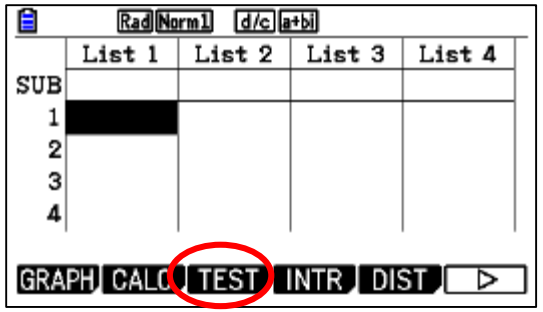


2-Sample T test

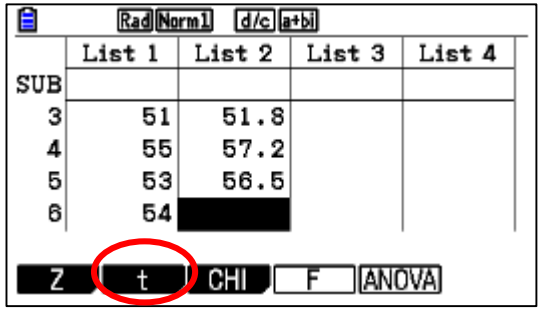
Example: Perform a 2-Sample T Test when two lists of data are input for **m1 ≠ m2** , List1 = {55, 54, 51, 55, 53, 53, 54, 53} and List2 = {55.5, 52.3,51.8, 57.2, 56.5} when pooling is not in effect.

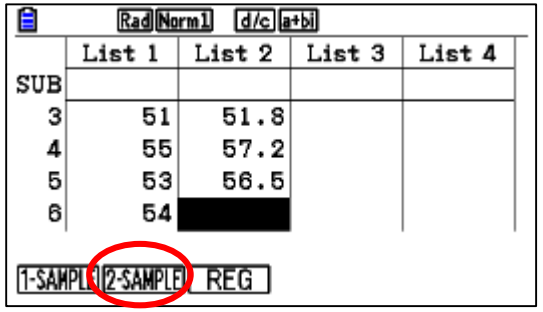
1. To enter the Statistics mode and clear old data : MENU 2



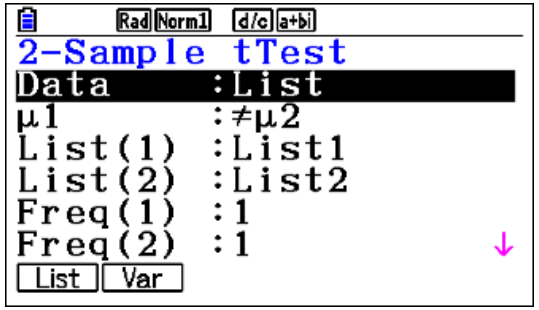


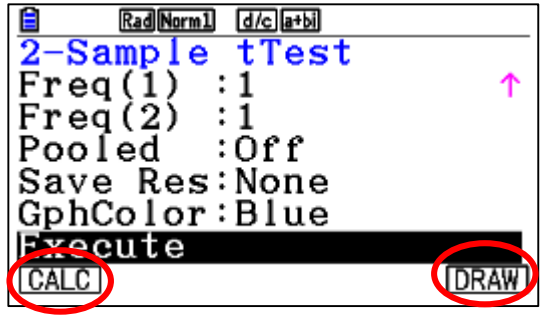
2. Fill the data and go to (TEST) and select T, 2-sample F3 F2 F2



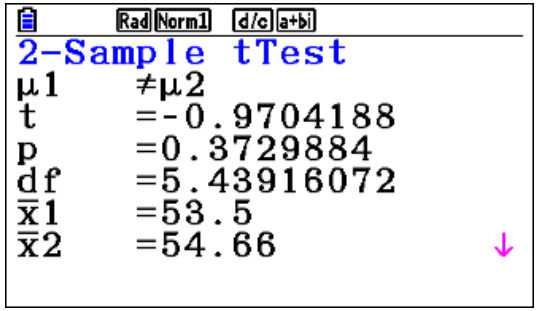


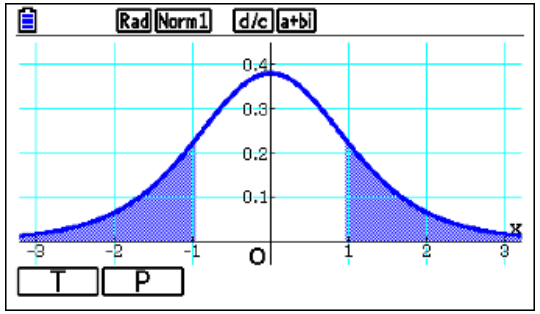
3. Fill the required data





4. Use the down arrows to calculate (F1) and to draw (F6)

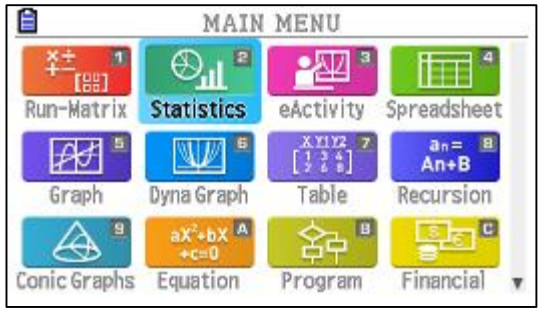


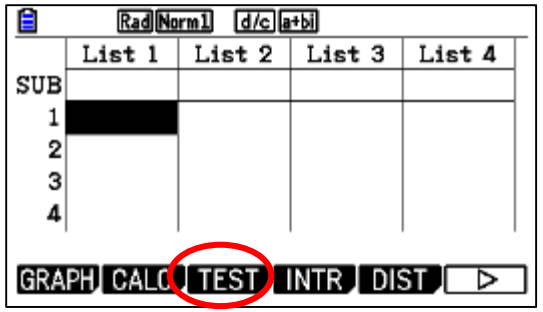


Linear Reg *t* Test

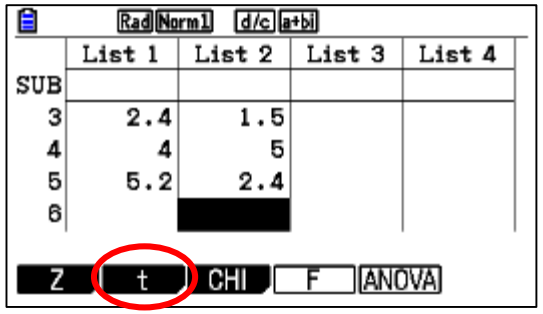
Example: Perform a Linear Reg *t* Test when two lists of data are input for this example, we will perform a Linear Reg *t* Test for *x*-axis data {0.5, 1.2, 2.4, 4, 5.2} and *y*-axis data {–2.1, 0.3, 1.5, 5, 2.4}.

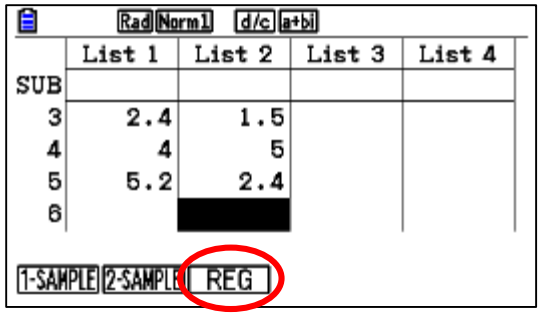
1. To enter the Statistics mode and clear old data : MENU 2



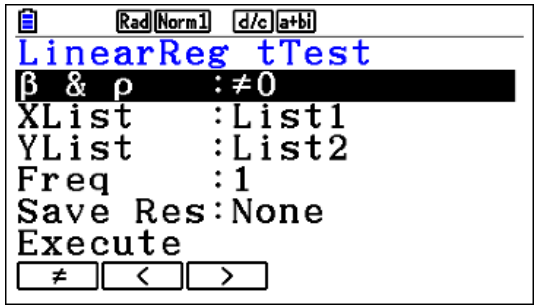


2. Fill the data and go to (TEST) select T - Reg F3 F2 F3

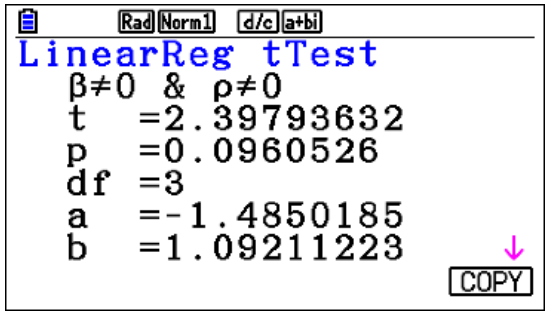


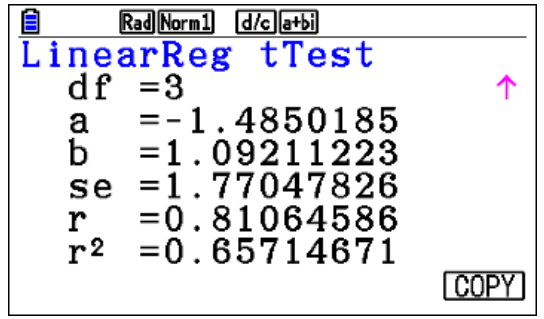


3. Fill the required data



4. Use the down arrows to calculate or press EXE



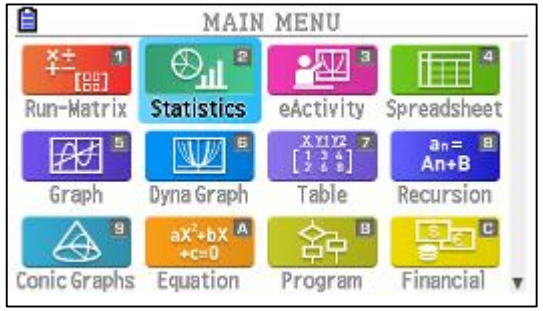


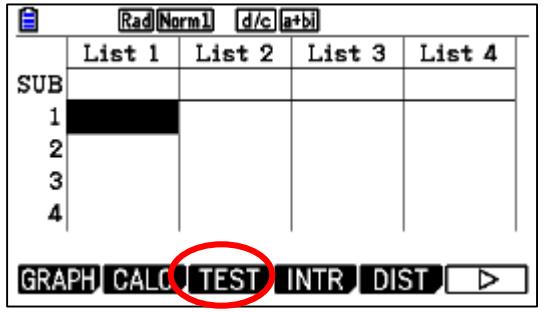
Chi-Square Test

Chi Test sets up several independent groups and tests hypotheses related to the proportion of the sample included in each group. The Test is applied to dichotomous variables (variable with two possible values, such as yes/no).

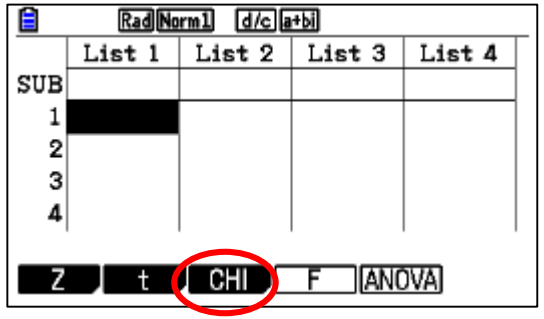
Example: To perform a χ^2 Test on a specific matrix cell, we will perform a χ^2 Test for Mat A, which contains the following data. $\begin{matrix}1 & 4\\ 5 & 10\end{matrix}$

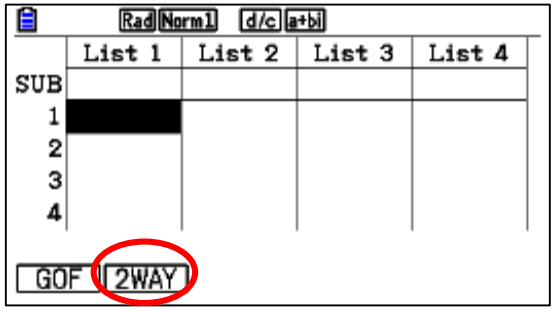
1. To enter the Statistics mode and clear old data : MENU 2



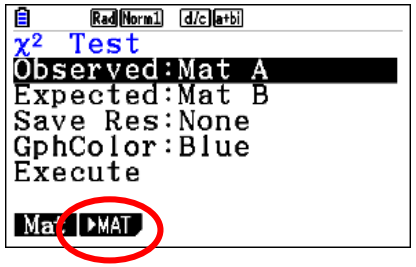


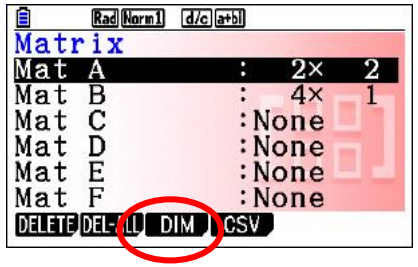
2. Go to (TEST) select Chi – 2 way F3 F3 F2

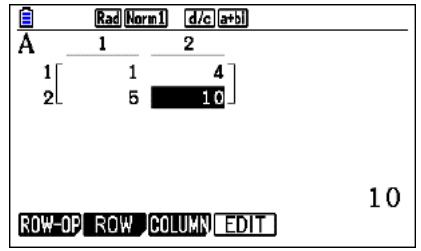




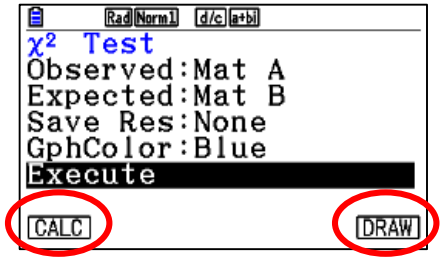
3. Define the observed matrix A and fill the matrix F2

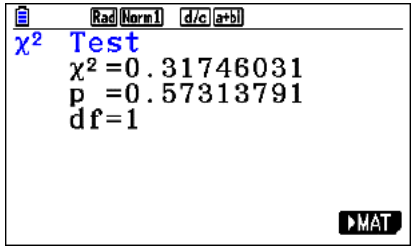


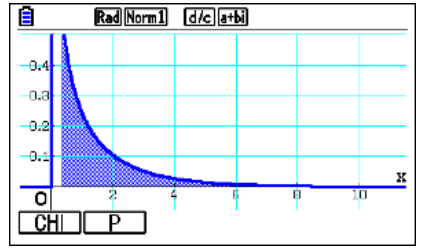




4. Use EXIT to go back and down arrow to calculate and draw



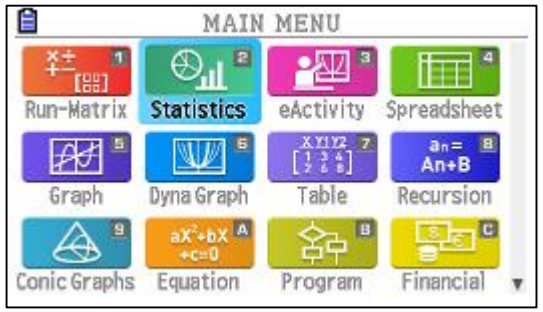


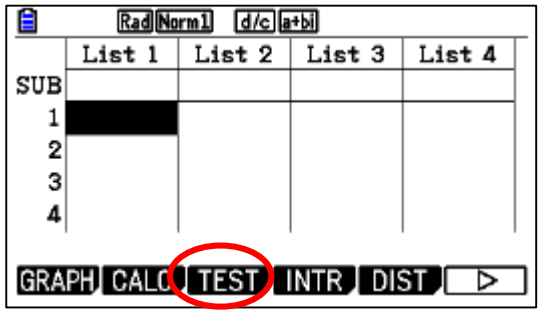


ANOVA tests

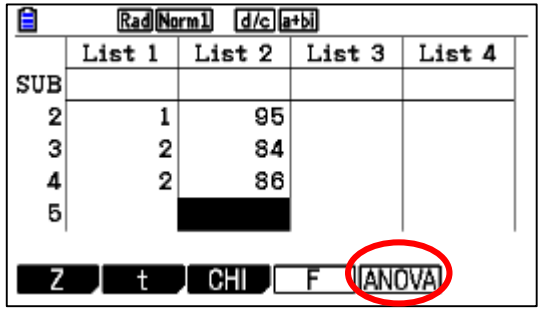
Example: Perform one-way ANOVA (analysis of variance) when three lists of data are input for this example, we will perform analysis of variance for the data List1 = {1,1,2,2} List2 = {90,95,84,86}.

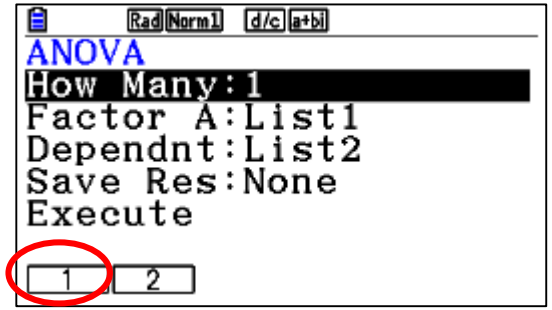
1. To enter the Statistics mode and clear old data : MENU 2



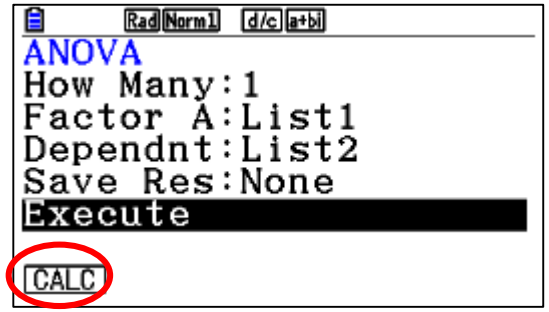


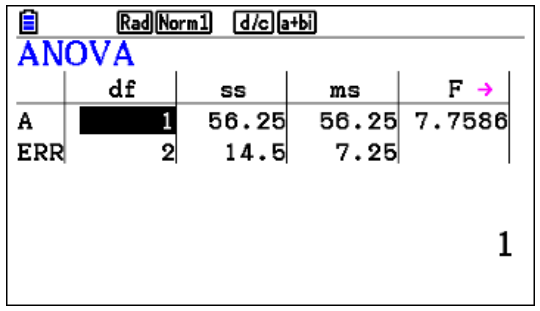
2. Fill the lists then go to (TEST) select ANOVA one variable F3 F5





3. Calculate ANOVA





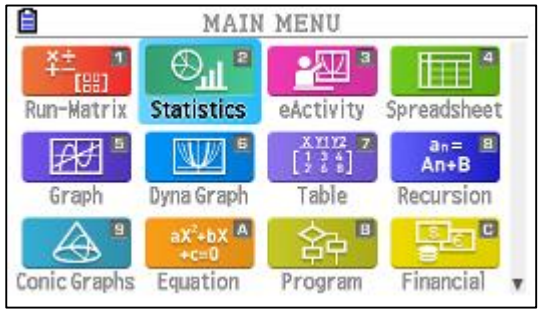
Example: Perform two-way ANOVA (analysis of variance) when three lists of data are input For this example, we will perform analysis of variance for the data

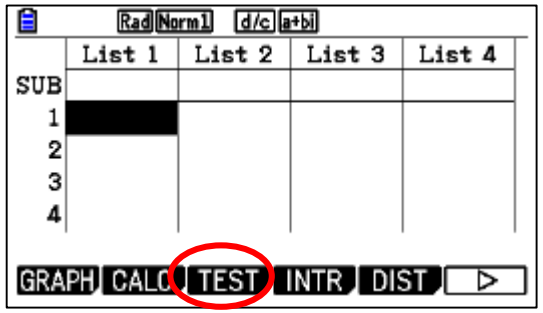
List1 = {1,1,1,1,2,2,2,2},

List2 = {1,1,2,2,1,1,2,2,}

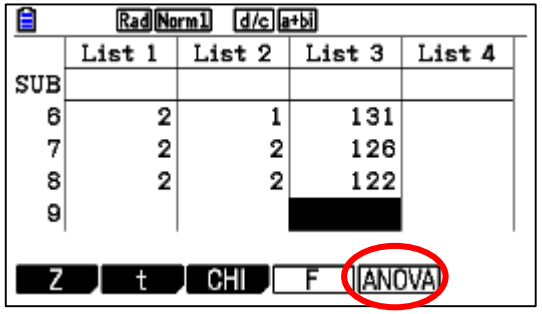
List3 = {113,116,139,132,133,131,126,122}.

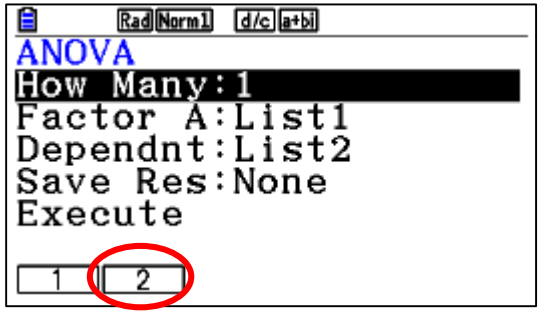
1. To enter the Statistics mode and clear old data : MENU 2



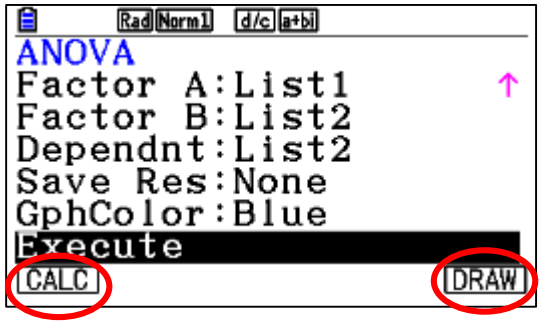


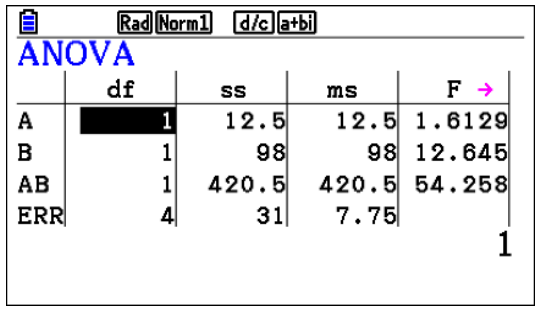
2. Fill the lists then go to (TEST) select ANOVA two variable F3 F5

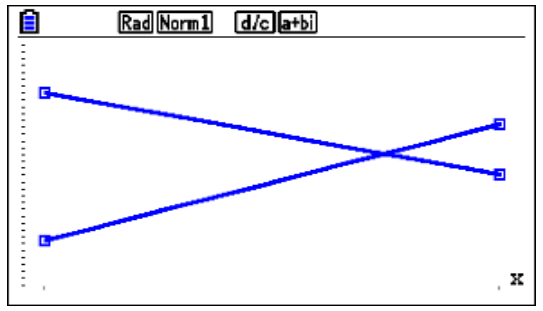




3. Use down arrow to calculate and draw ANOVA

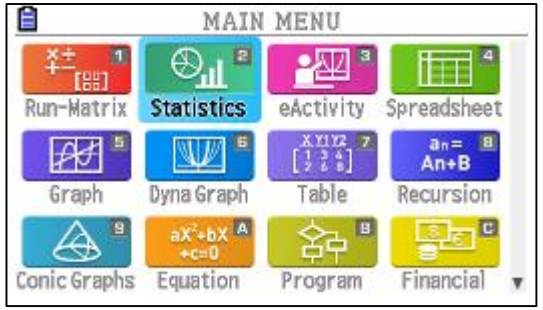


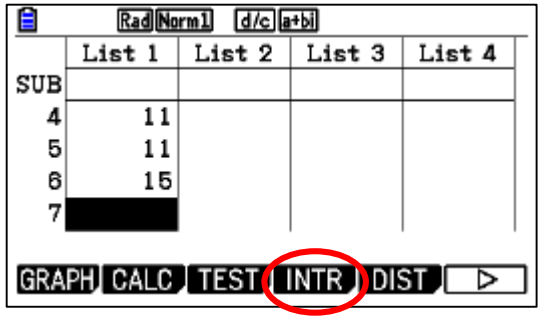




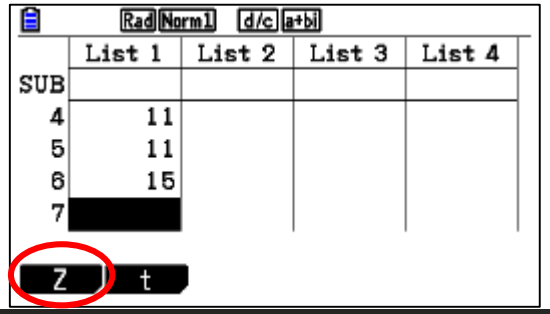
Example: To calculate the **1-Sample *Z*** Interval for one list of data, we will obtain the *Z* Interval for the data {11, 10, 12, 11, 11,15}, when C-Level = 0.95 (95% confidence level) and σ = 3.

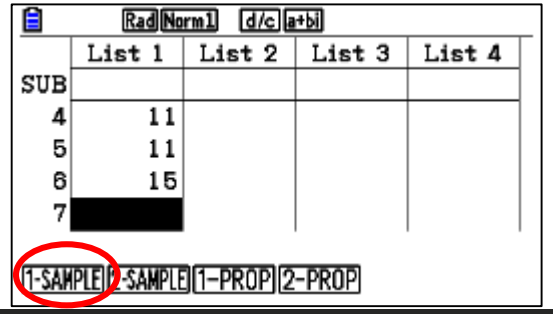
1. To enter the Statistics mode and clear old data : MENU 2



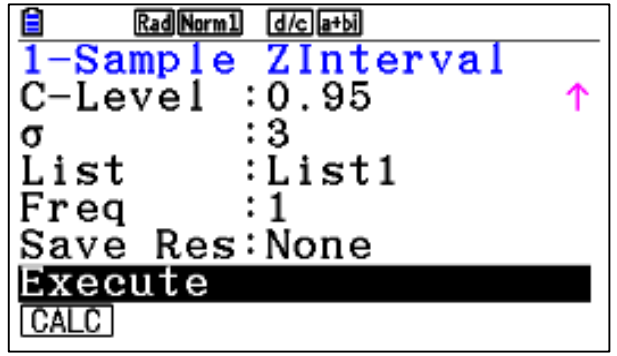


2. Fill the new datalist and select (INTR) 1-sample Z F4 F1 F1

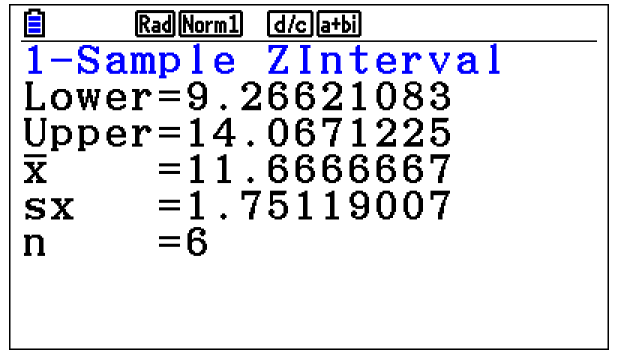




3. Fill the required data



4. EXE to calculate the interval



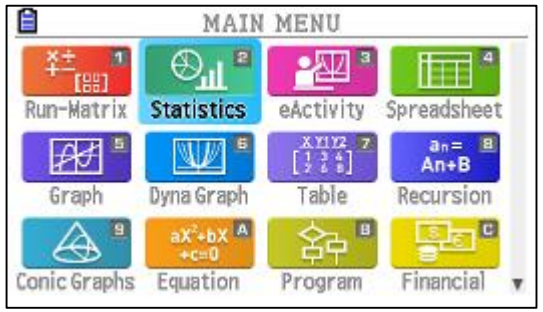
Example: To calculate the 2-Sample Z Interval when two lists of data are input for this example, we will obtain the 2-Sample Z Interval for the

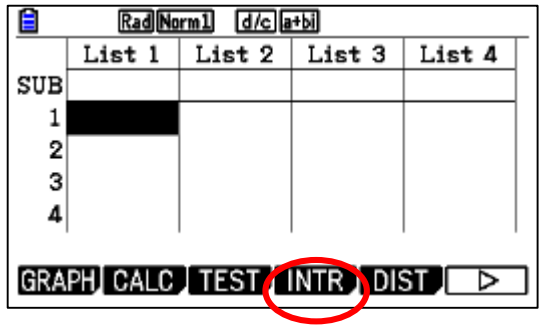
data 1 = {55, 54, 51, 55, 53, 53, 54, 53}

data 2 = {55.5, 52.3,51.8, 57.2, 56.5}

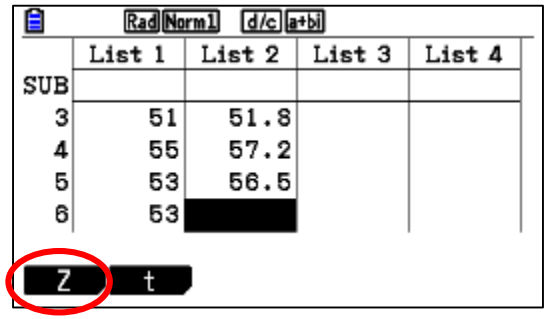
when C-Level = 0.95 (95% confidence level), σ1 = 15.5, and σ2 = 13.5.

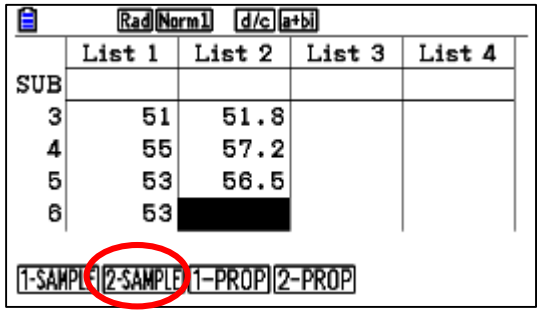
1. To enter the Statistics mode and clear old data : MENU 2



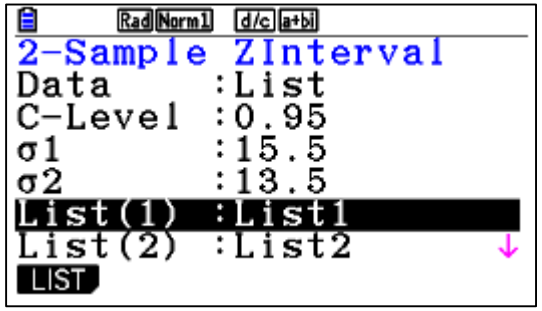


2. Fill the new data list and select (INTR) 2-sample Z F4 F1 F2

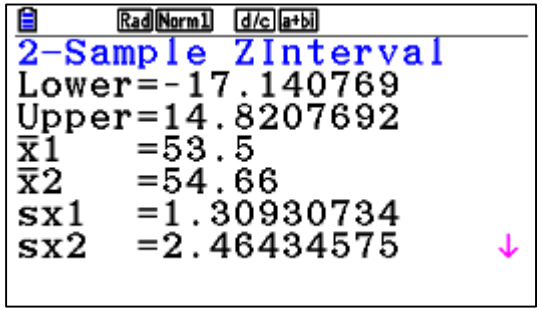




3. Fill the required data

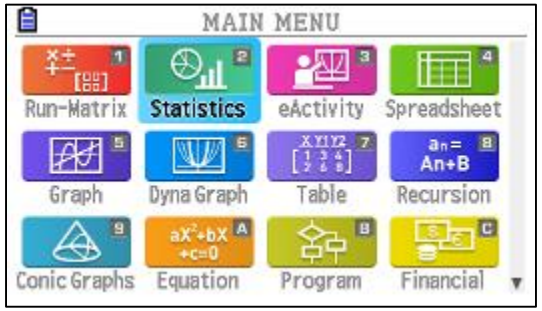


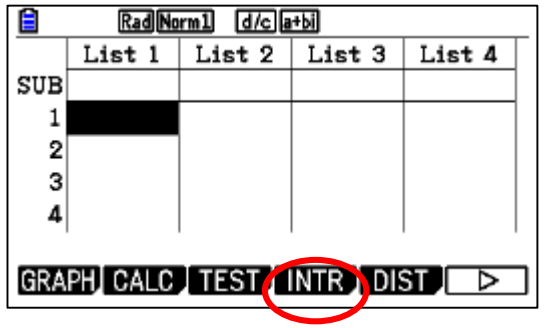
4. EXE to calculate the interval



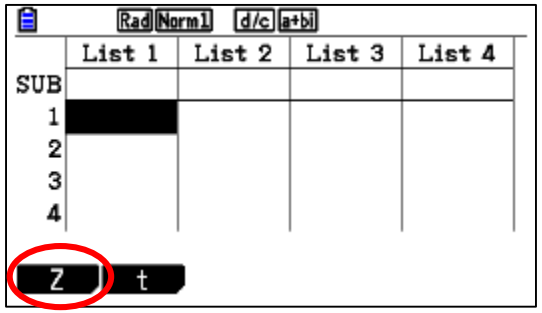
Example: To calculate the **1-Prop *Z*** Interval using parameter value specification for this example, we will obtain the 1-Prop *Z* Interval when C-Level = 0.99, x = 55, and n = 100.

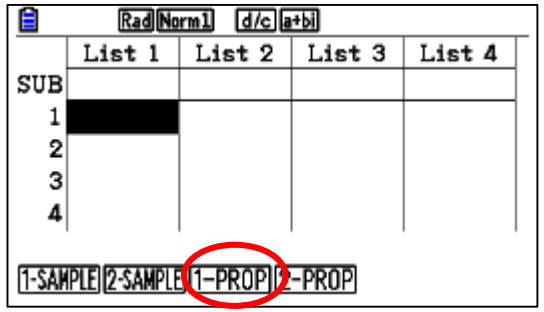
1. To enter the Statistics mode and clear old data : MENU 2



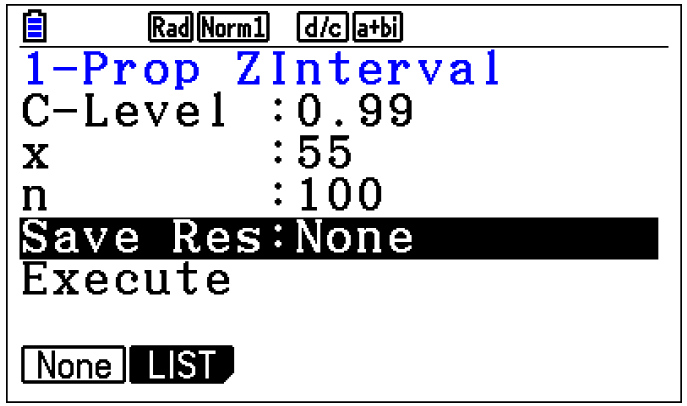


2. Go to (INTR) 1-Prop Z F4 F1 F3

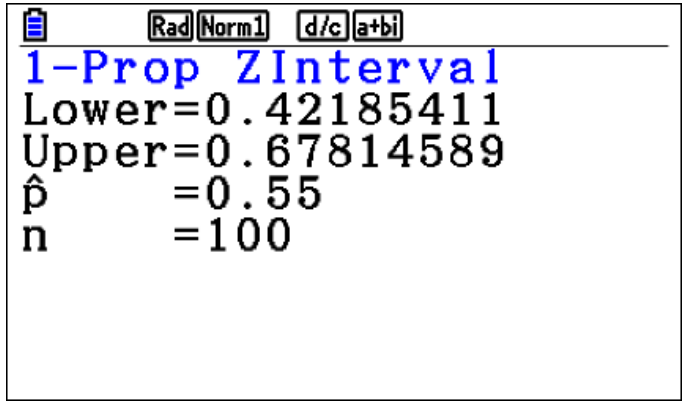




3. Fill the required data

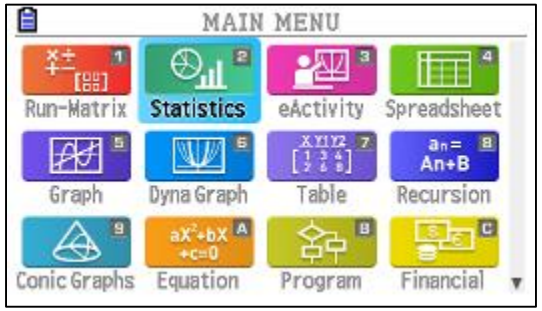


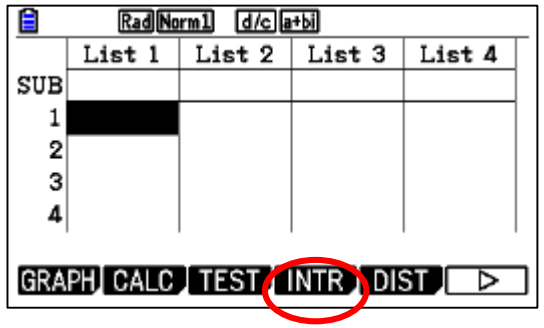
4. EXE to calculate the interval



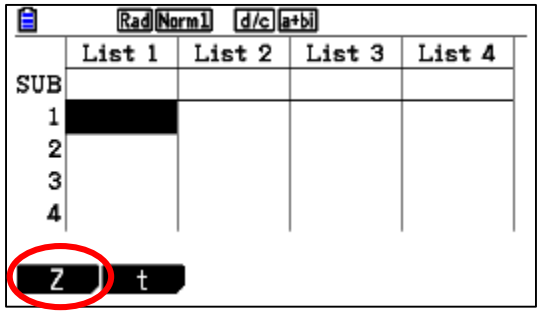
Example: To calculate the **2-Prop *Z*** Interval using parameter value specification for this example, we will obtain the 2-Prop *Z* Interval when C-Level = 0.95, $x1 = 49$, $n1 = 61$, $x2 = 38$ and $n2 = 62$.

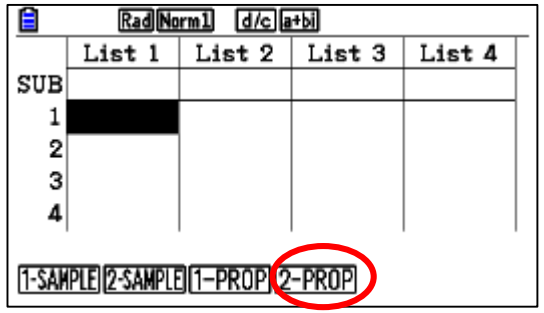
1. To enter the Statistics mode and clear old data : MENU 2



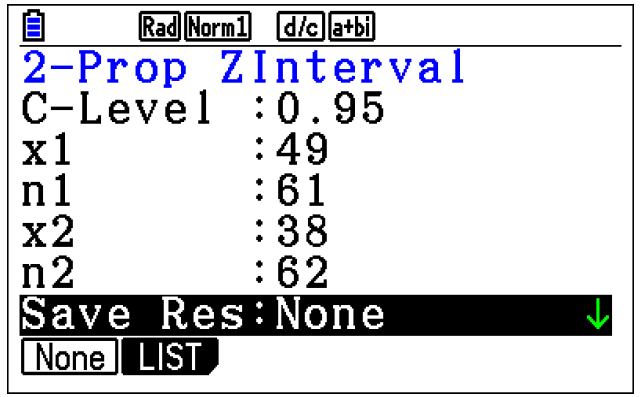


2. Go to (INTR) 2-Prop Z F4 F1 F4

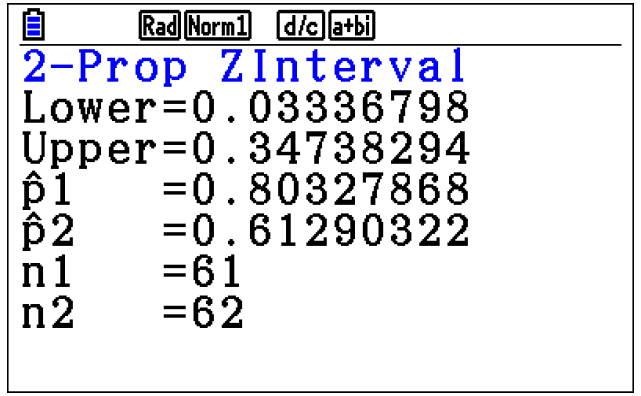




3. Fill the required data

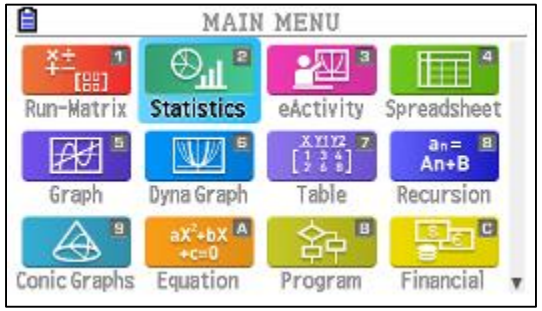


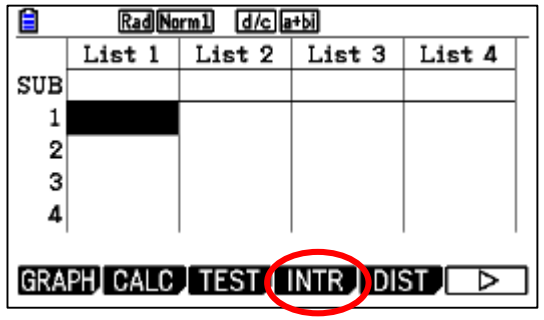
4. EXE to calculate the interval



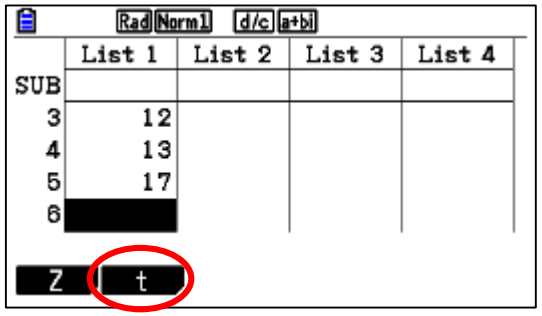
Example: To calculate the **1-Sample *t*** Interval for one list of data, we will obtain the 1-Sample *t* Interval for data = {11, 10, 12, 13, 17} when C-Level = 0.95.

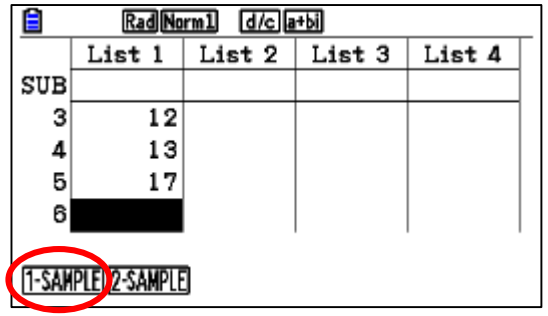
1. To enter the Statistics mode and clear old data : MENU 2



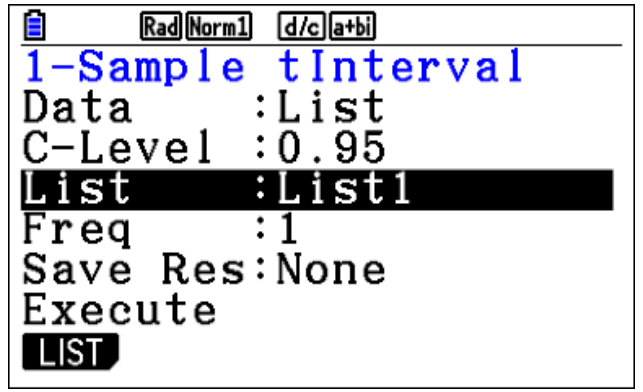


2.Fill the list and go to (INTR) 1-sample T F4 F2 F1

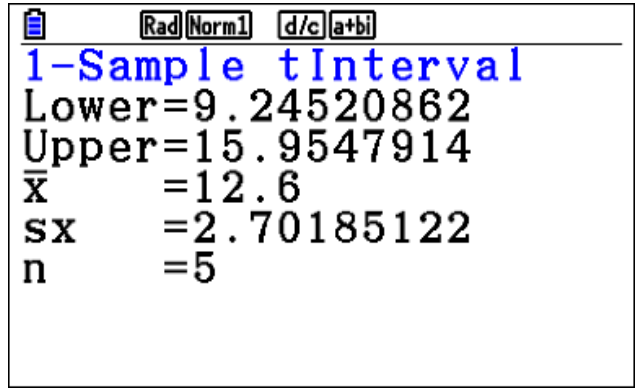




3. Fill the required data



4. EXE to calculate the interval

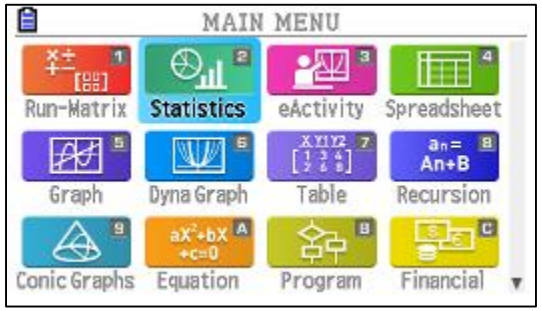


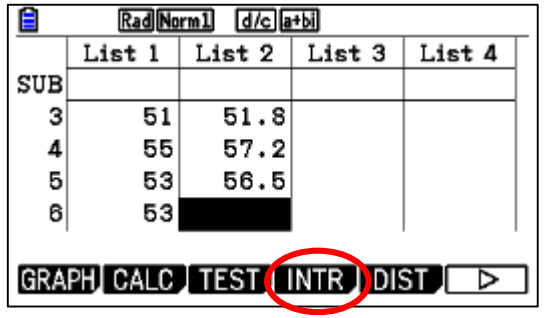
Example: To calculate the 2-Sample *t* Interval when two lists of data are input, we will obtain the 2-Sample *t* Interval for

data 1 = {55, 54, 51, 55, 53, 53, 54, 53}

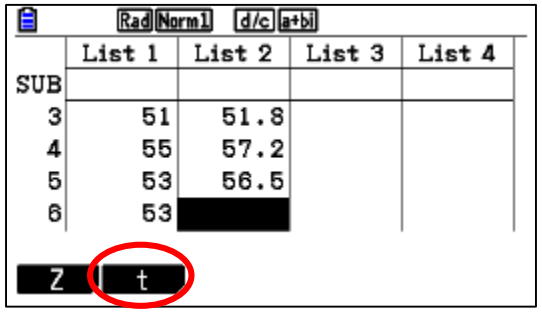
data 2 = {55.5, 52.3, 51.8, 57.2, 56.5} without pooling when C-Level = 0.95.

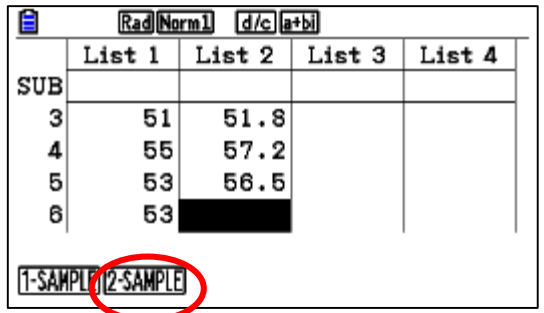
1. To enter the Statistics mode and clear old data : MENU 2



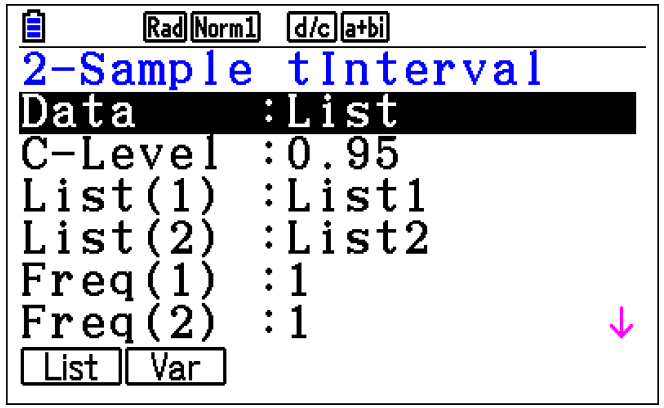


2.Fill the list and go to (INTR) 1-sample T F4 F2 F2

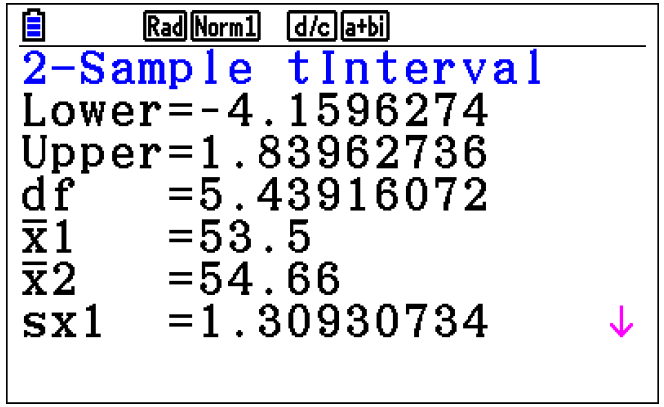




3. Fill the required data



4. EXE to calculate the interval



Solving Samples of Math Problems

Using

CASIO fx-CG50 CALCULATOR

For $-1.5 < x < 1.5$, let f be a function with first derivative given by $f'(x) = e^{(x^4-2x^2+1)} - 2$. Which of the following are all intervals on which the graph of f is concave down?

(A) $(-0.418, 0.418)$ only

(B) $(-1, 1)$

(C) $(-1.354, -0.409)$ and $(0.409, 1.354)$

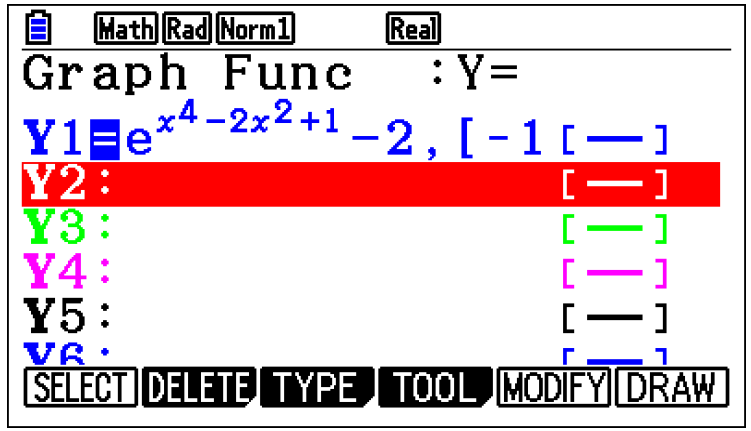
(D) $(-1.5, -1)$ and $(0, 1)$

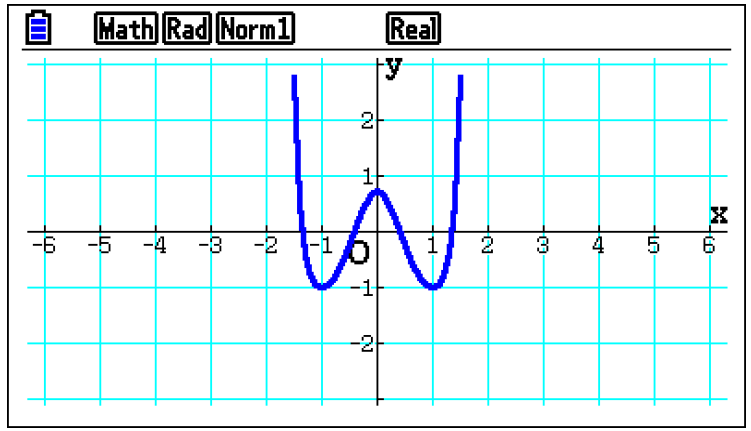
(E) $(-1.5, -1.354)$, $(-0.409, 0)$, and $(1.354, 1.5)$

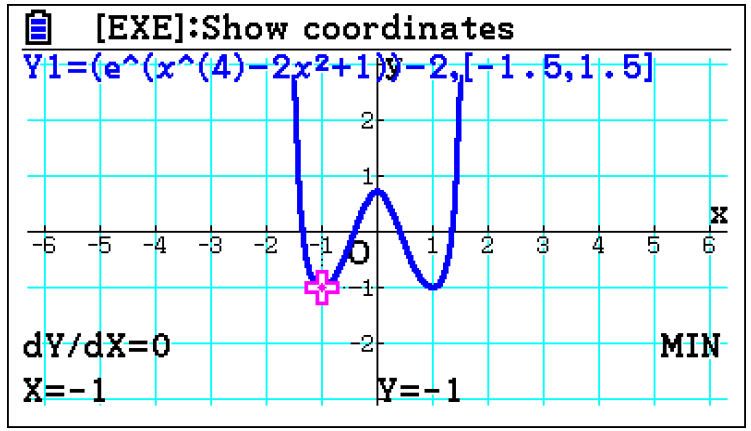
Note: f(x) is concave down when f''(x) is negative.

$f\text{^}''(x) = e\text{^}((x\text{^}4 - 2x\text{^}2 + 1))\,(4x\text{^}3 - 4x)$

Or f'(x) slope is negative (decreasing)



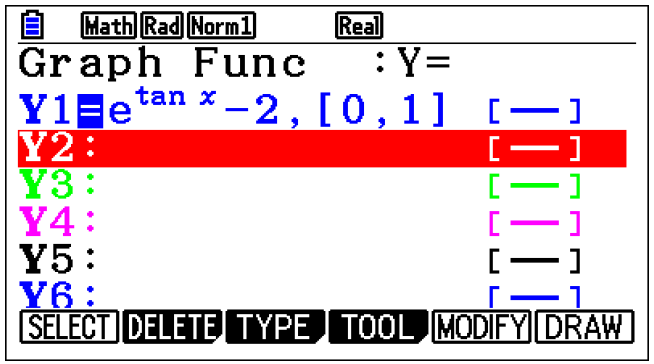




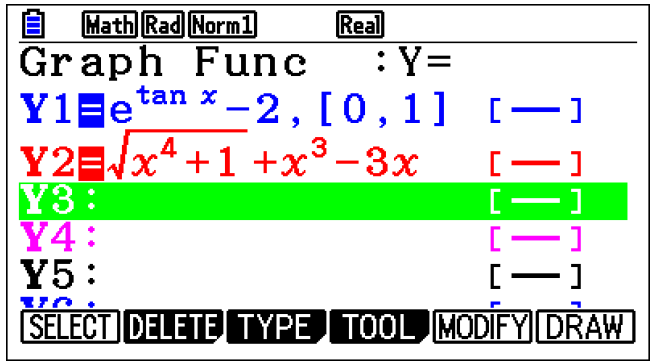
If $f'(x) = \sqrt{x^4 + 1} + x^3 - 3x$, then f has a local maximum at $x =$

(A) -2.314 (B) -1.332 (C) 0.350 **(D) 0.829** (E) 1.234

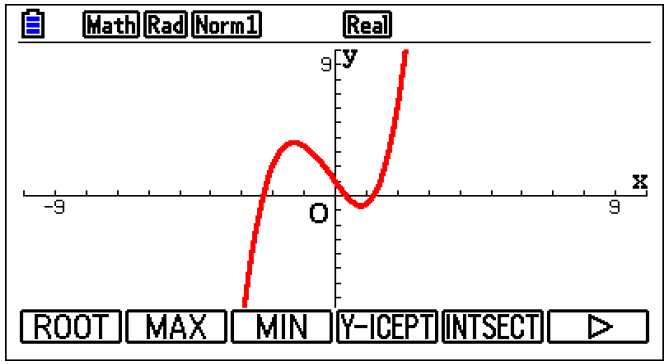
Note: f(x) has local maximum when f'(x) changes from positive to negative.



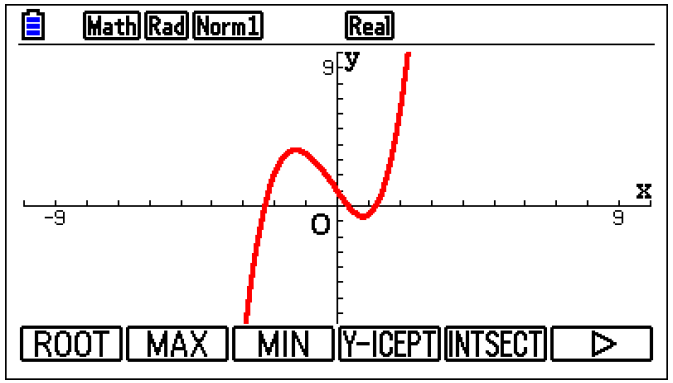
1- select Graph mode



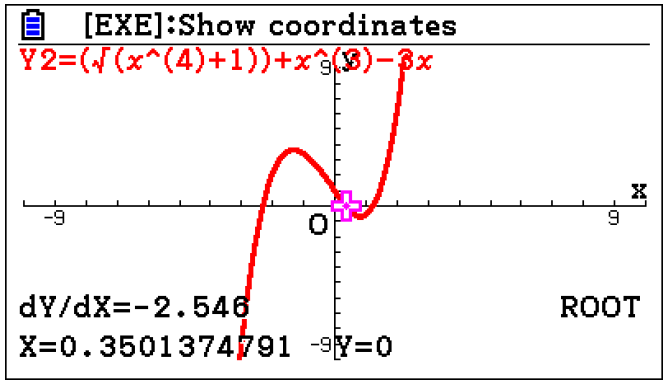
2- write the function



3- draw the function



4- G-Solve to see the roots



Which of the following is an equation for a line tangent to the graph of $f(x) = e^{2x}$ when $f'(x) = 10$?

(A) $y = 10x - 8.05$

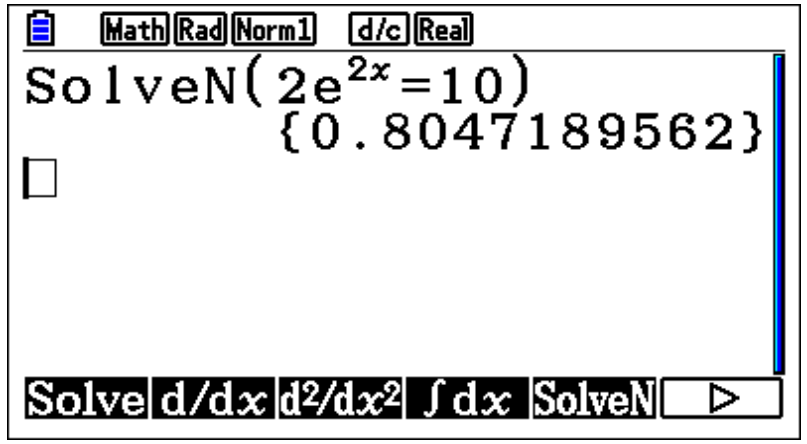
(B) $y = x - 8.05$

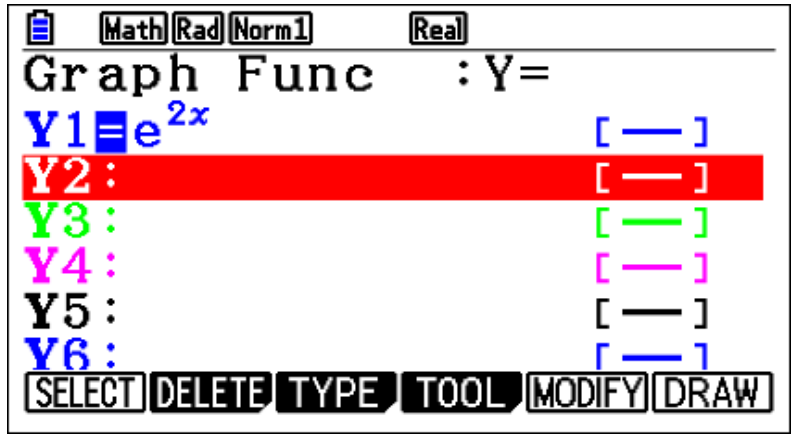
(C) $y = x - 3.05$

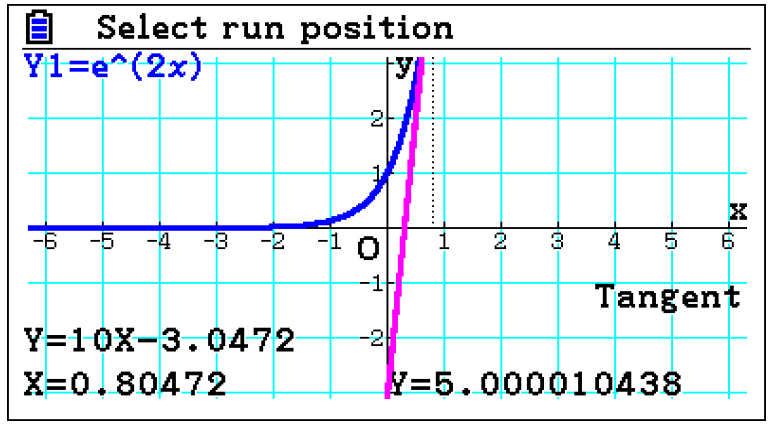
(D) $y = 10x - 11.5$

(E) $y = 10x - 3.05$

Note: we need the point to write the equation by using f'(x) = 10
find x then substitute to find y







What is the area of the region bounded by $y = \sin x$, $y = \frac{1}{4}x - 1$, and the y-axis?

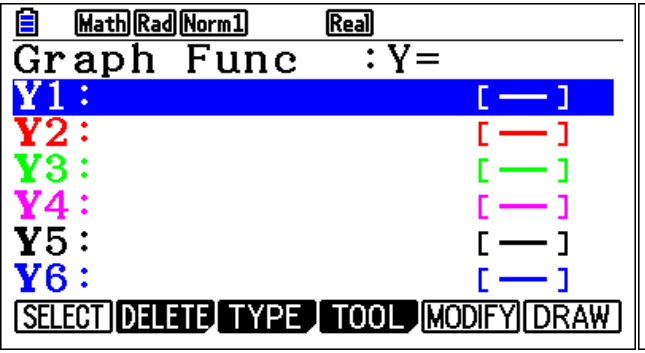
(A) 0.772

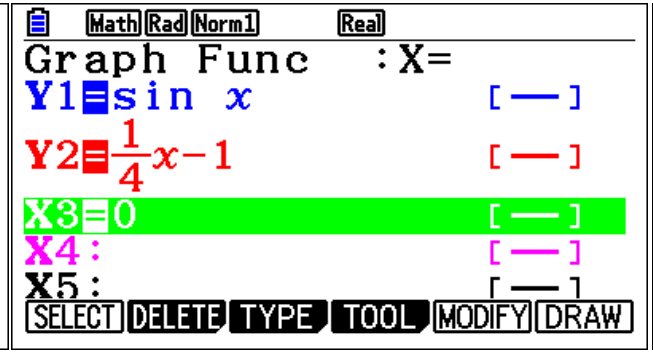
(B) 2.815

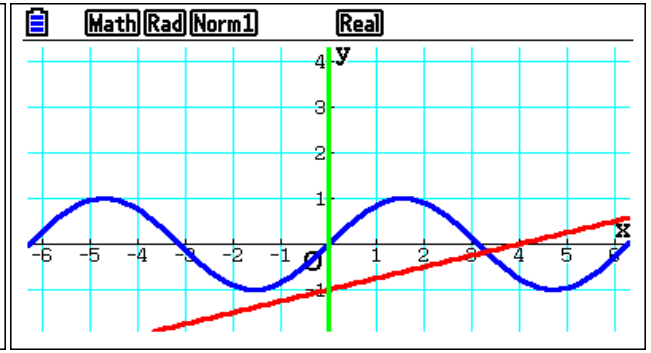
(C) 3.926

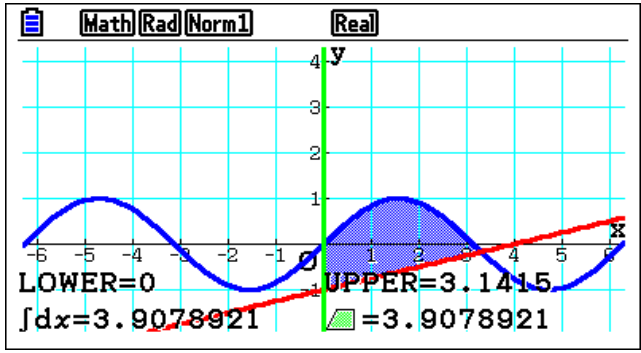
(D) 5.552

(E) 34.882









The function f whose derivative is given by $f'(x) = 5x^3 - 15x + 7$ has a local maximum at $x =$

(A) -1.930

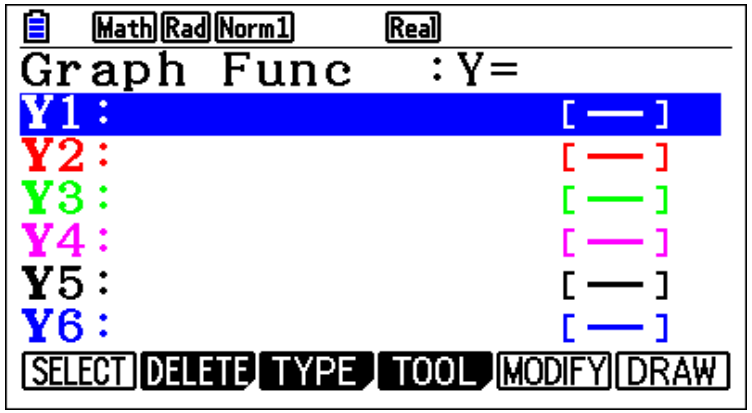
(B) -1.000

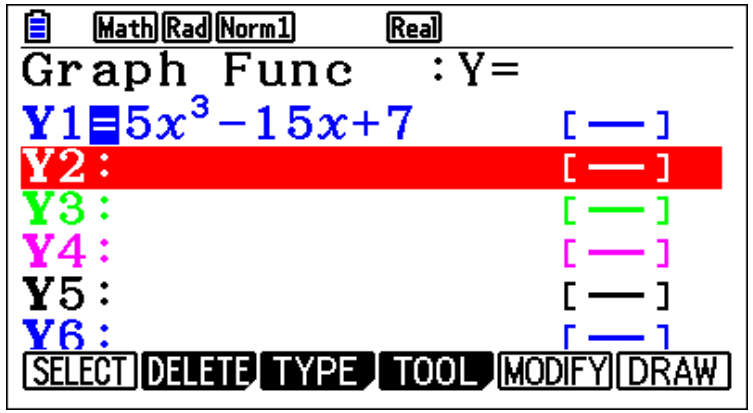
(C) 0.511

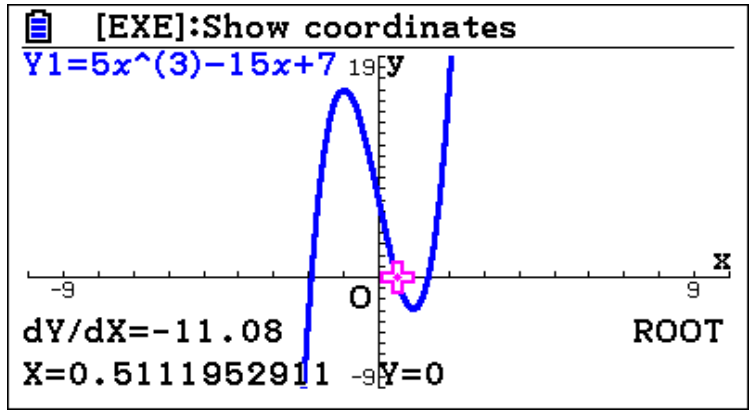
(D) 1.000

(E) 1.419

Note: local maximum is a point which is the function goes increasing then decreasing for f(x), and the graph is positive then negative for f'(x)

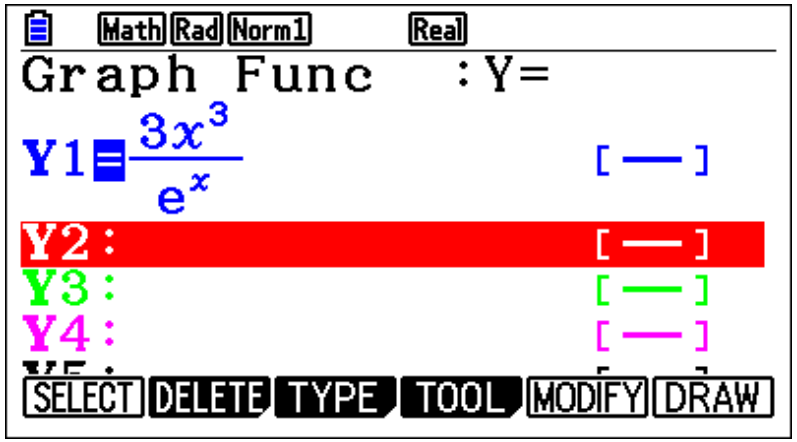


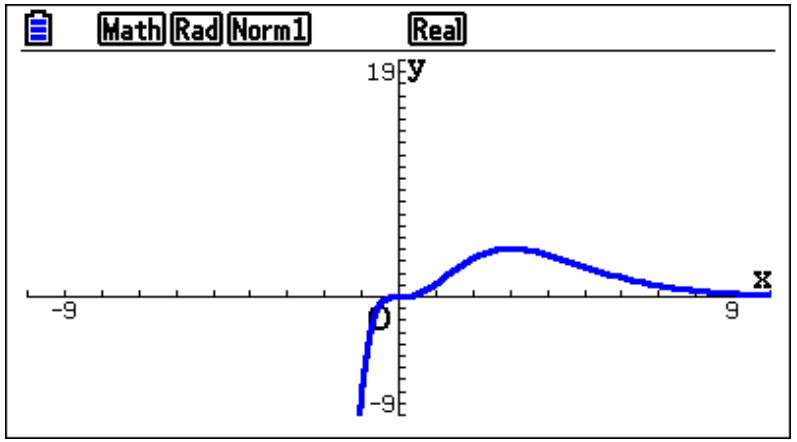


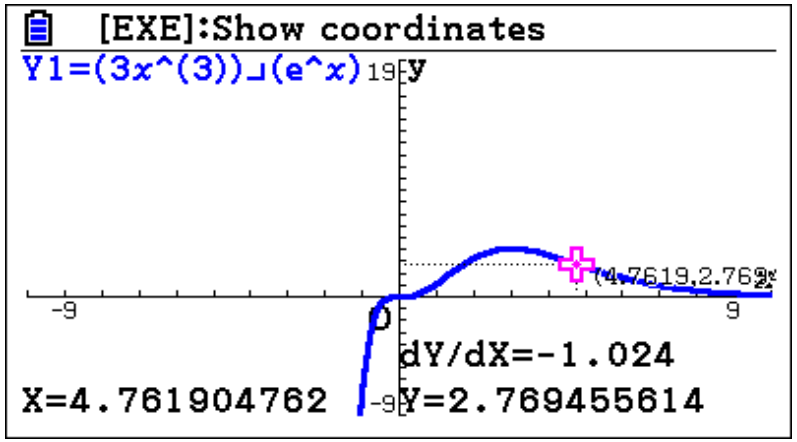


Let f be the function given by $f(x) = \frac{3x^3}{e^x}$. For what value of x is the slope of the line tangent to f equal to -1.024?

(A) -9.004
(B) -4.732
(C) 1.029
(D) 1.277
(E) 4.797







The graph of the function $y = x^5 - x^2 + \sin x$ changes concavity at $x =$

(A) 0.324

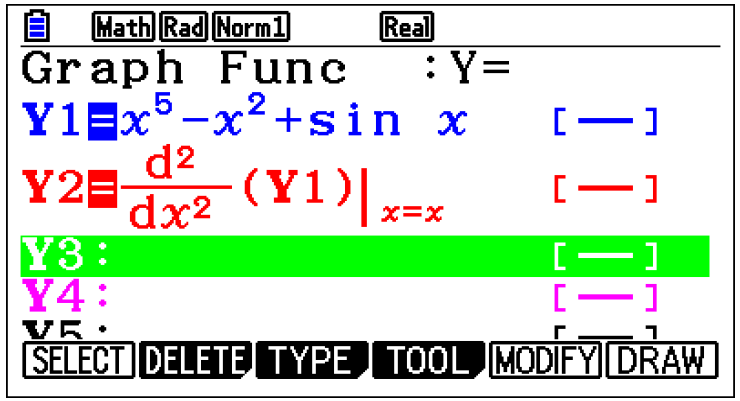
(B) 0.499

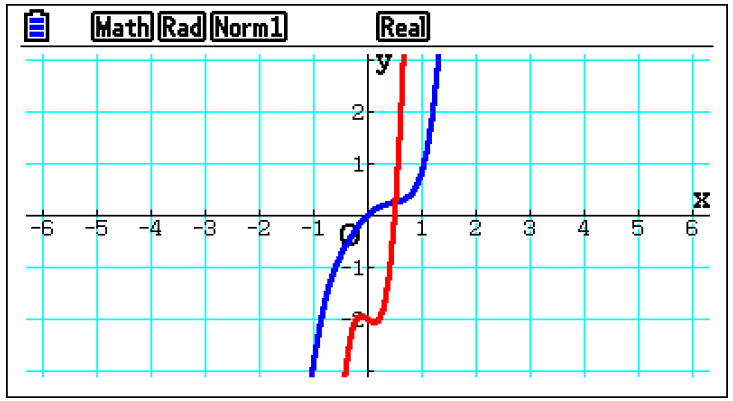
(C) 0.506

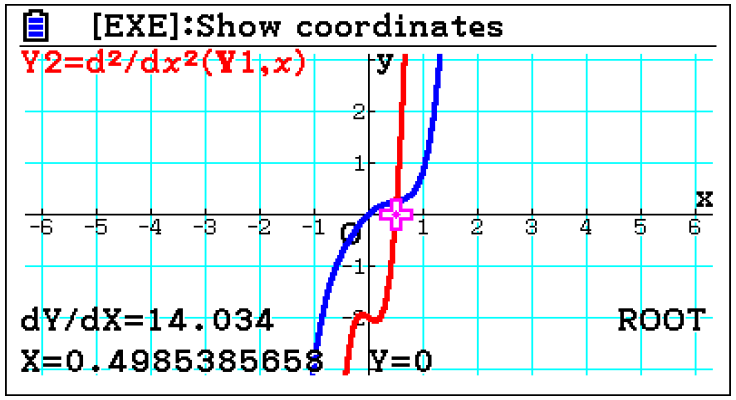
(D) 0.611

(E) 0.704

Note: second derivative graph shows the concavity clearly at the root.

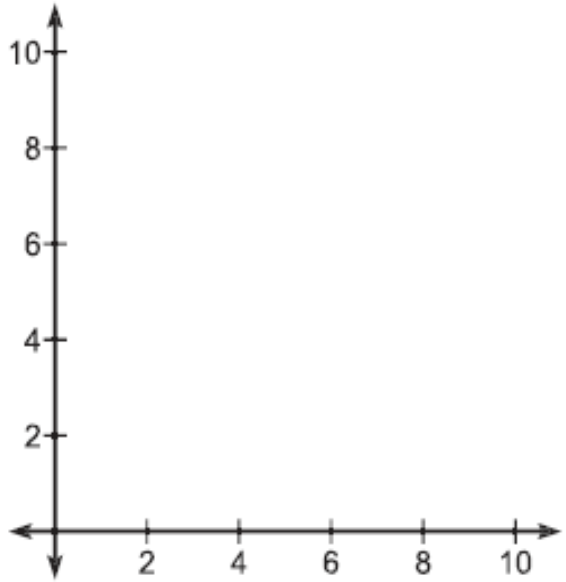






Let R be the region bound by $y = 2x^2 - 8x + 11$ and $y = x^2 - 4x + 10$.

(a) Sketch the region on the axes provided.



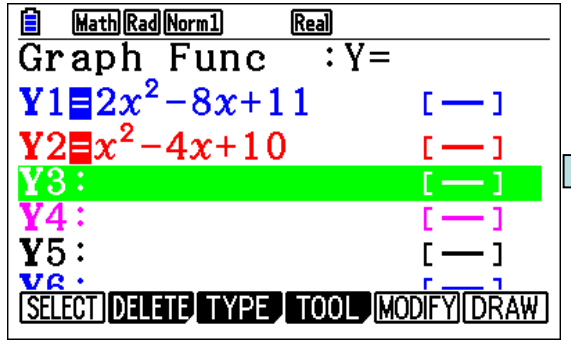
(b) Determine the area of R.

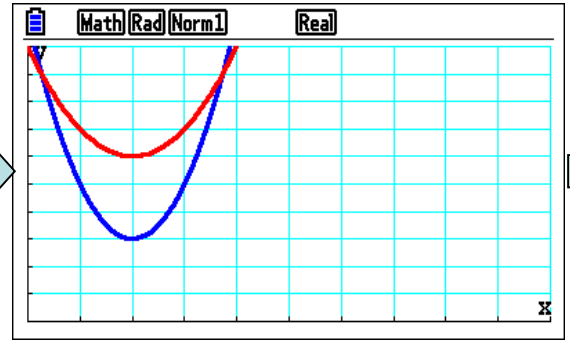
1. Drawing the functions

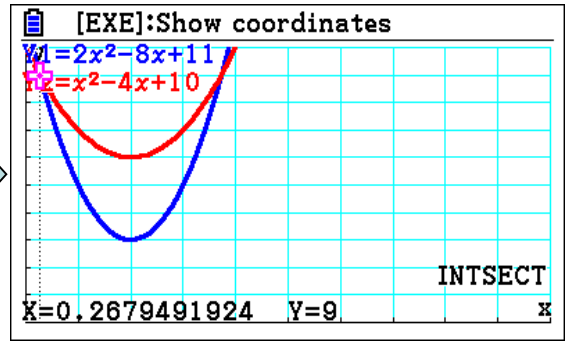
2. determine the intersection points

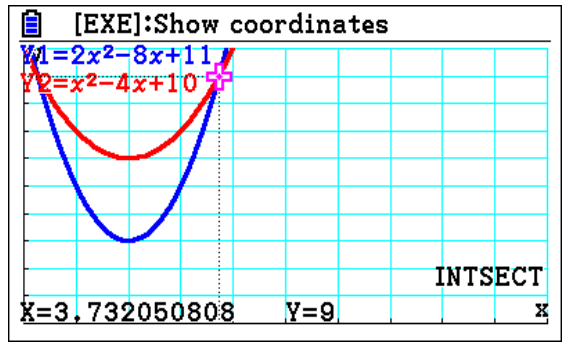
3. Calculate the area

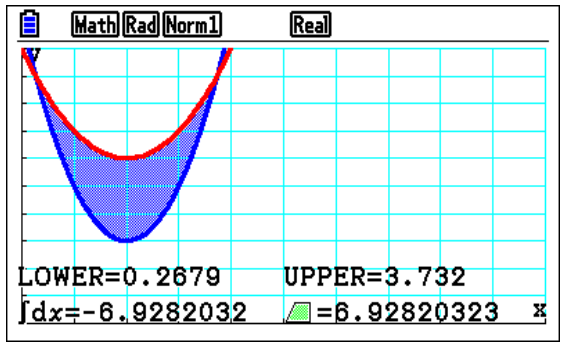
Note: after sketching the graph we need to determine the intersection points to find the area and volume .







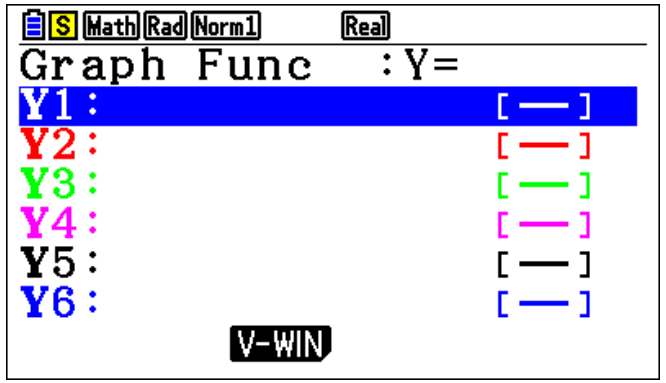


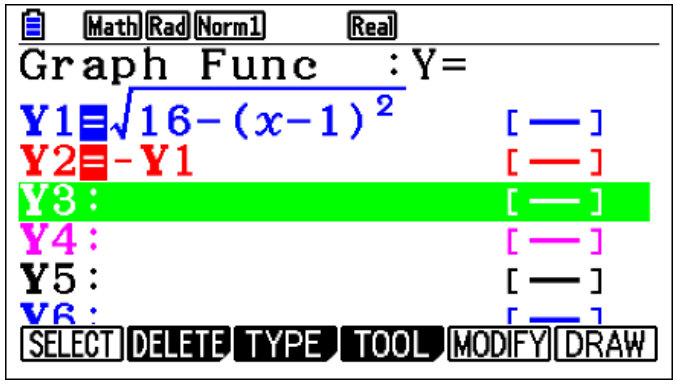


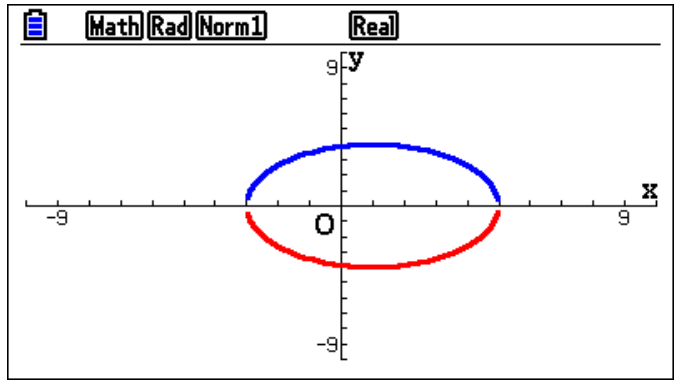
1. Let f be the functions given by:

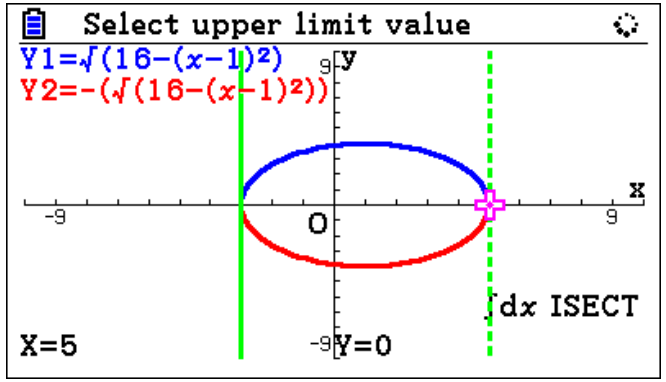
$$f(x) = \sqrt{16 - (x-1)^2}$$

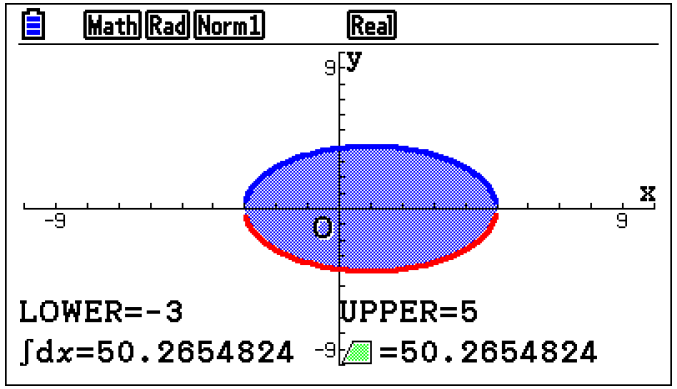
Find the area of the region enclosed by the graphs of f(x) and -f(x).







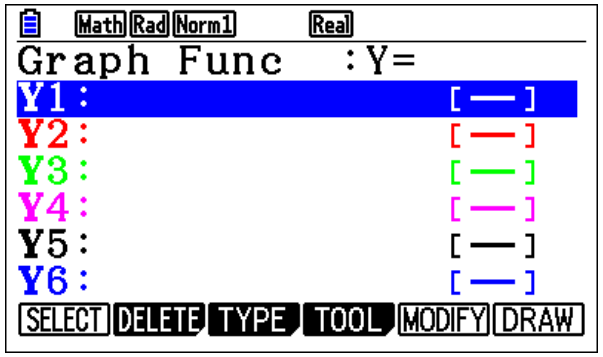


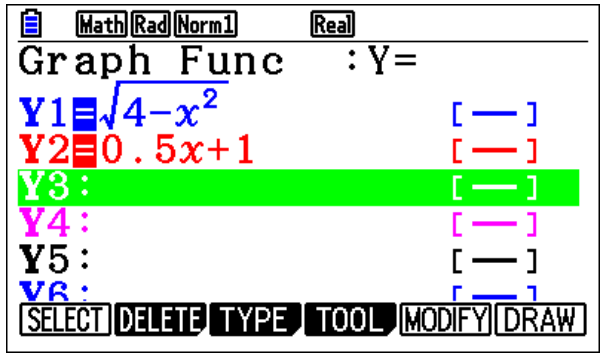


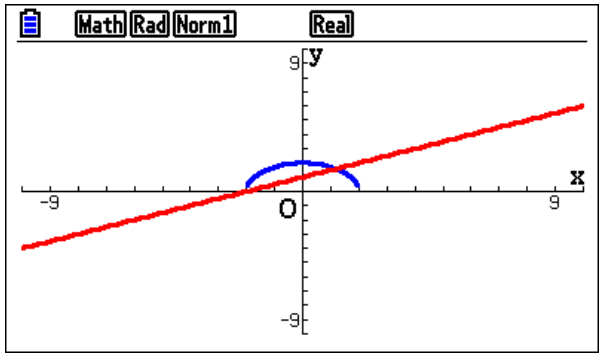
Let f and g be the functions given by:

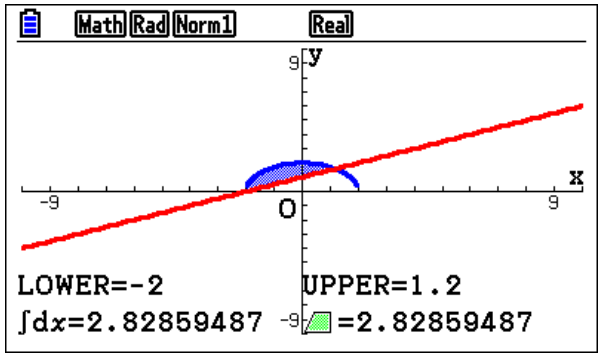
$$f(x) = \sqrt{4 - x^2}$$
$$g(x) = 0.5x + 1$$

Let R be the region in the first and second quadrants enclosed by the graphs of f and g. Find the area of R.





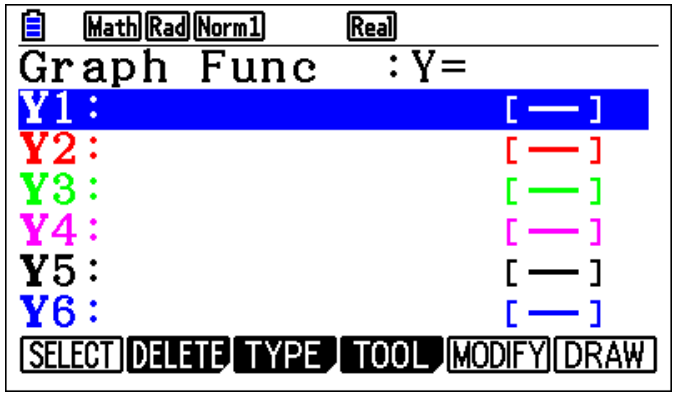


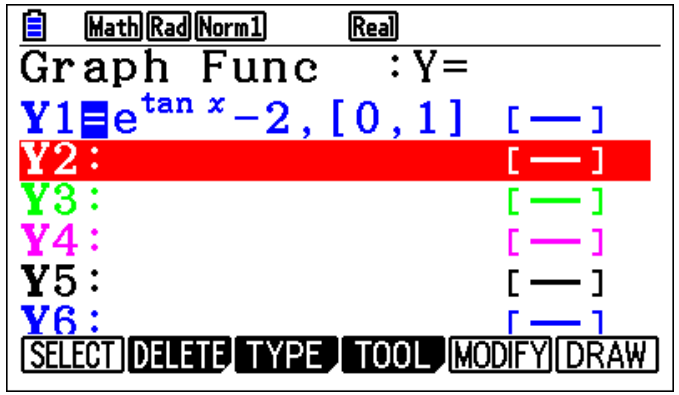


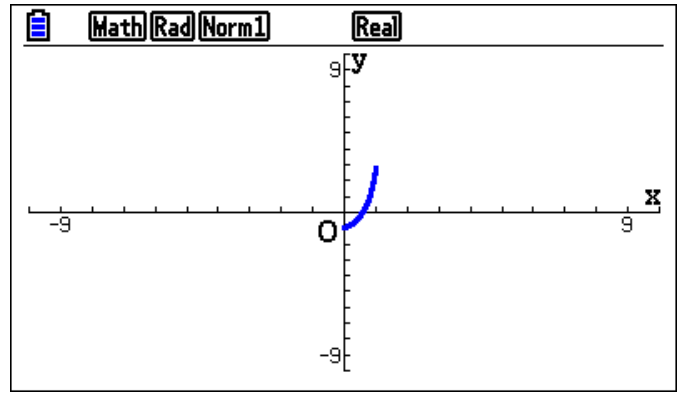
Answer : (2.828)

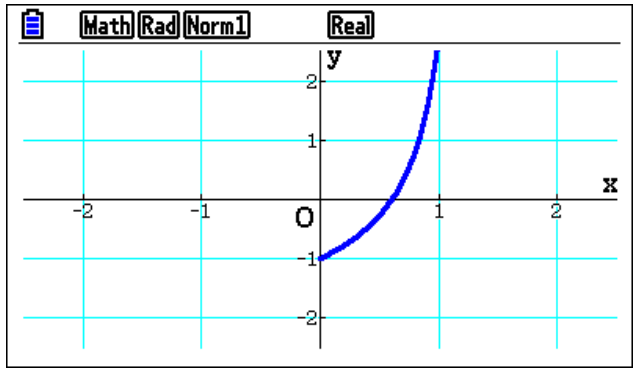
The graph of $y = e^{\tan x} - 2$ crosses the x-axis at one point in the interval $[0, 1]$. What is the slope of the graph at this point?

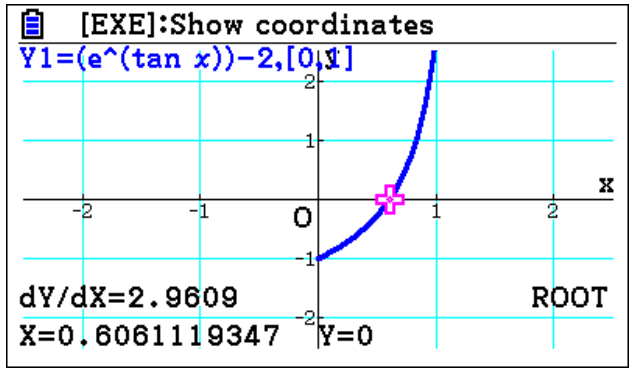
(A) 0.606 (B) 2 (C) 2.242 **(D) 2.961** (E) 3.747







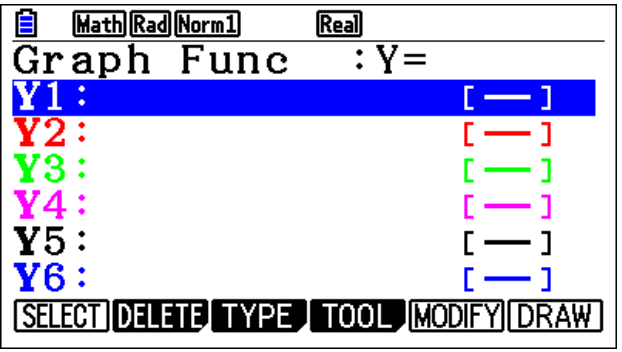


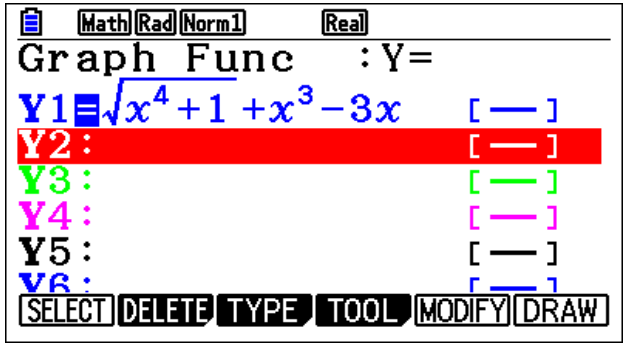


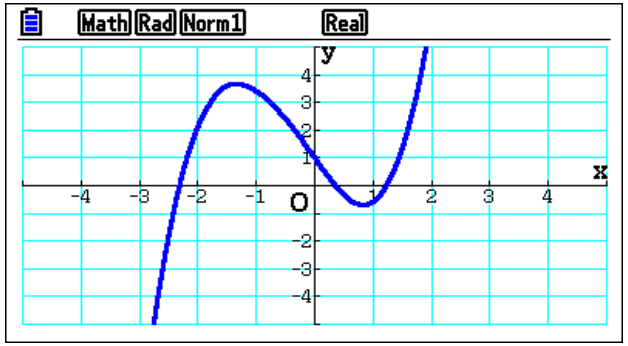
If $f'(x) = \sqrt{x^4 + 1} + x^3 - 3x$, then f has a local maximum at $x =$

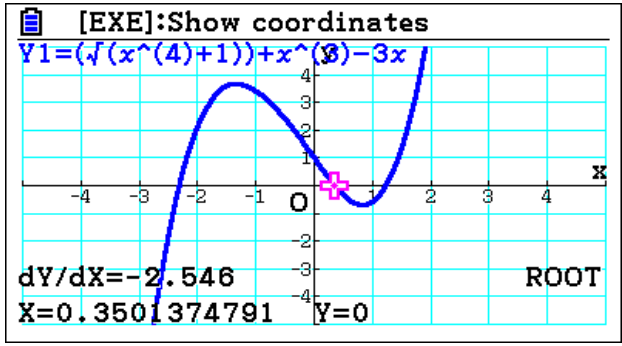
(A) –2.314 (B) –1.332 **(C) 0.350** (D) 0.829 (E) 1.234

Note: the maximum local are existing when the curve increasing then decreasing for f(x) , and if the curve above x-axis then goes down x-axis for f'(x)



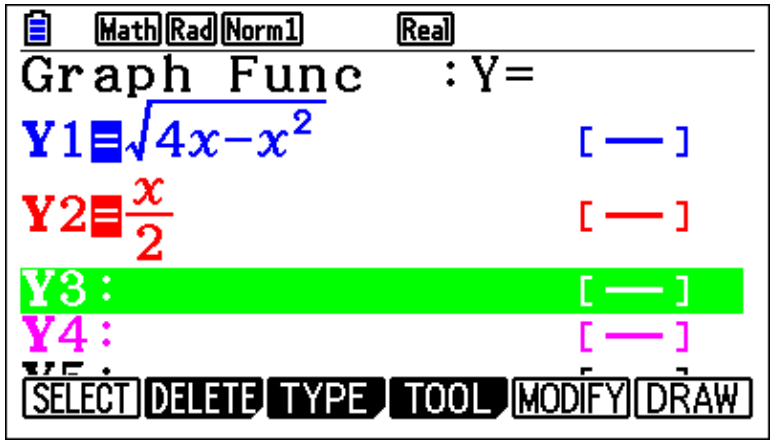


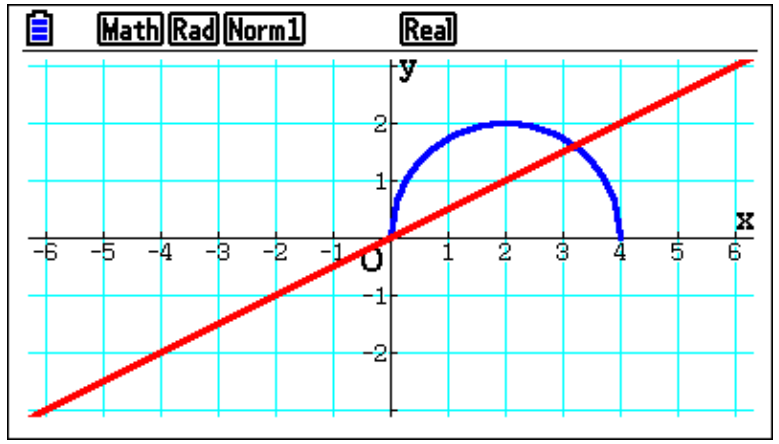


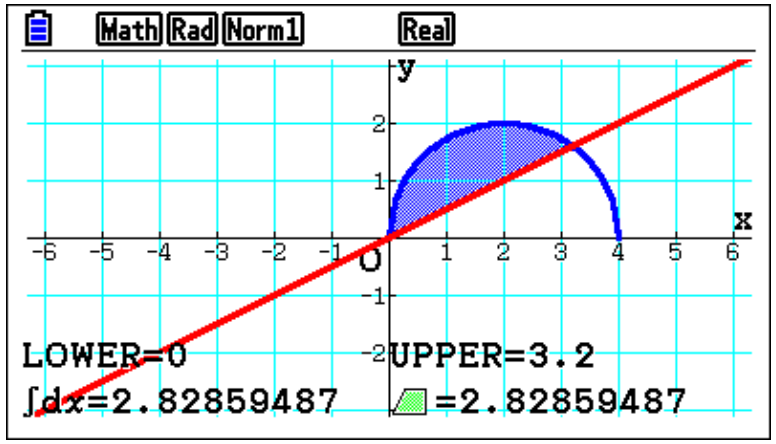


What is the area of the region enclosed by the graphs of $y = \sqrt{4x - x^2}$ and $y = \frac{x}{2}$?

(A) 1.707 **(B) 2.829** (C) 5.389 (D) 8.886 (E) 21.447

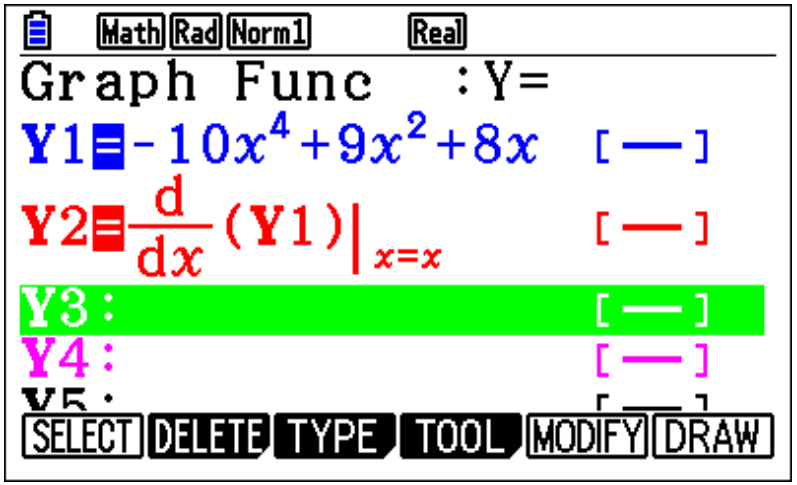


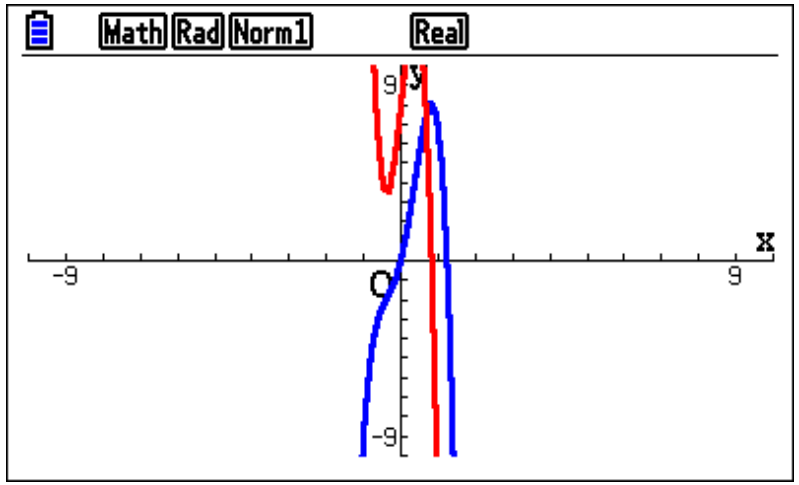


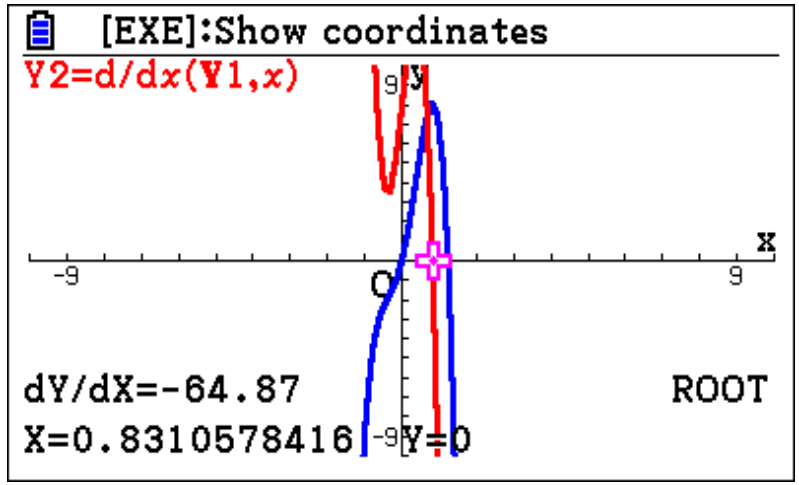


A particle moves along the x-axis so that its position at time $t > 0$ is given by $x(t)$ and $\frac{dx}{dt} = -10t^4 + 9t^2 + 8t$. The acceleration of the particle is zero when $t =$

(A) 0.387 (B) 0.831 (C) 1.243 (D) 1.647 (E) 8.094

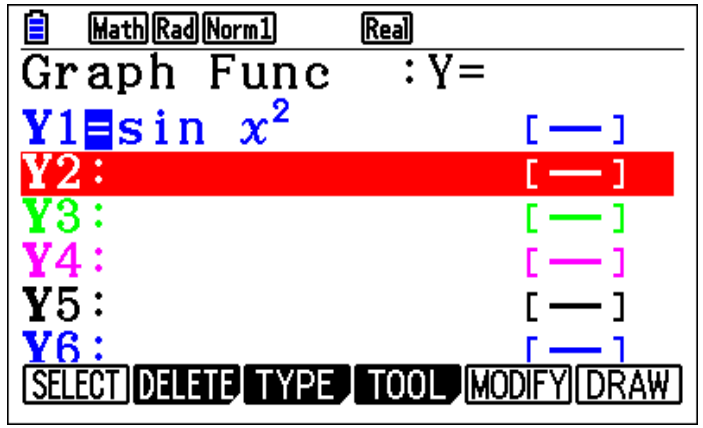


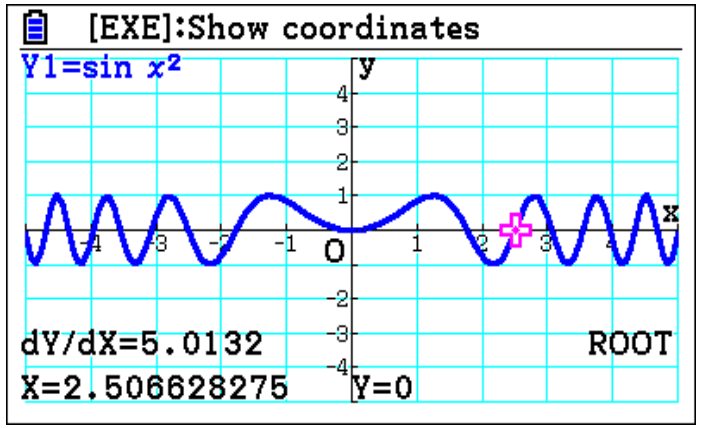


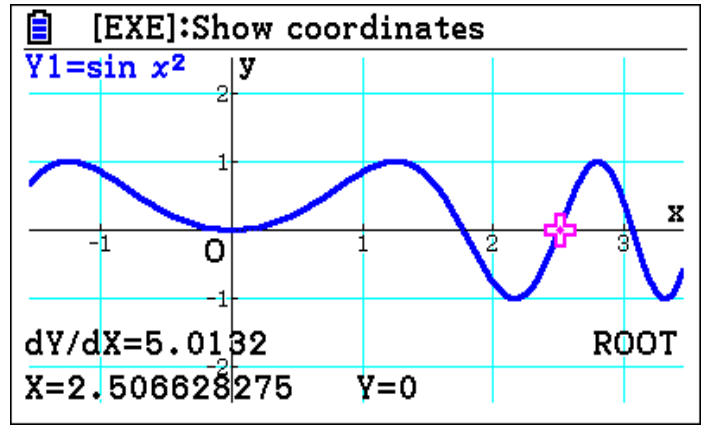


The first derivative of the function f is given by $f'(x) = \sin\left(x^2\right)$. At which of the following values of x does f have a local minimum?

(A) 2.507 (B) 2.171 (C) 1.772 (D) 1.253 (E) 0

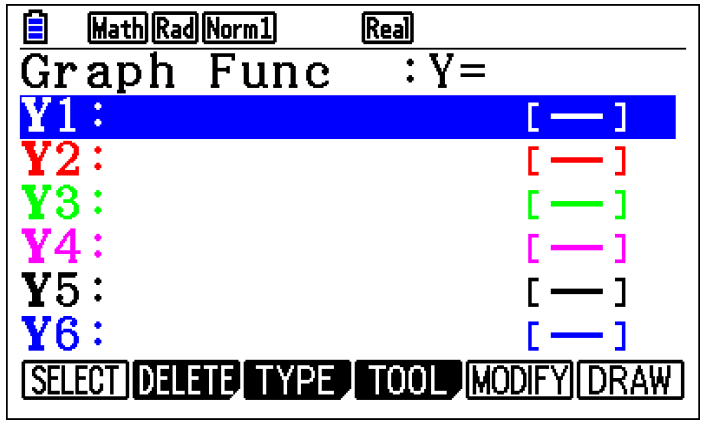


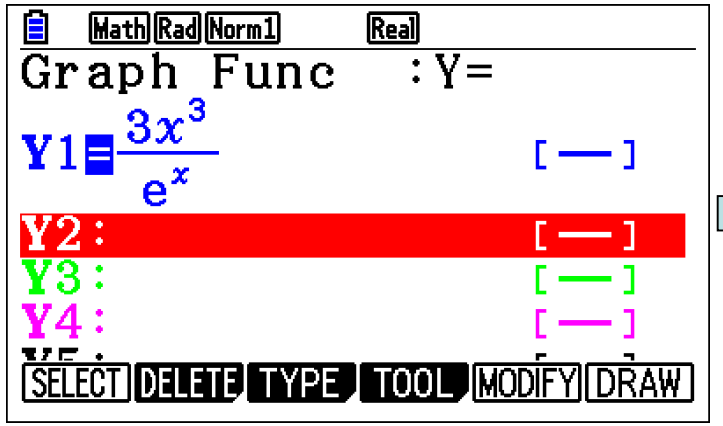


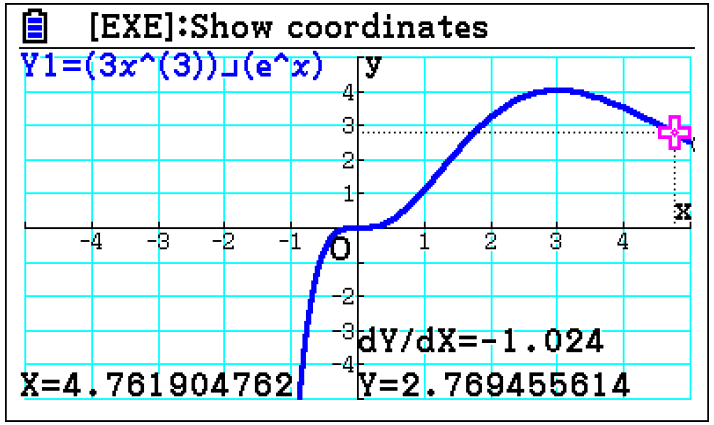


Let f be the function given by $f(x)=\frac{3x^3}{e^x}$. For what value of x is the slope of the line tangent to f equal to -1.024?

(A) -9.004
(B) -4.732
(C) 1.029
(D) 1.277
(E) 4.797







The graph of $y = 3x^3 - 2x^2 + 6x - 2$ is decreasing for which interval(s)?

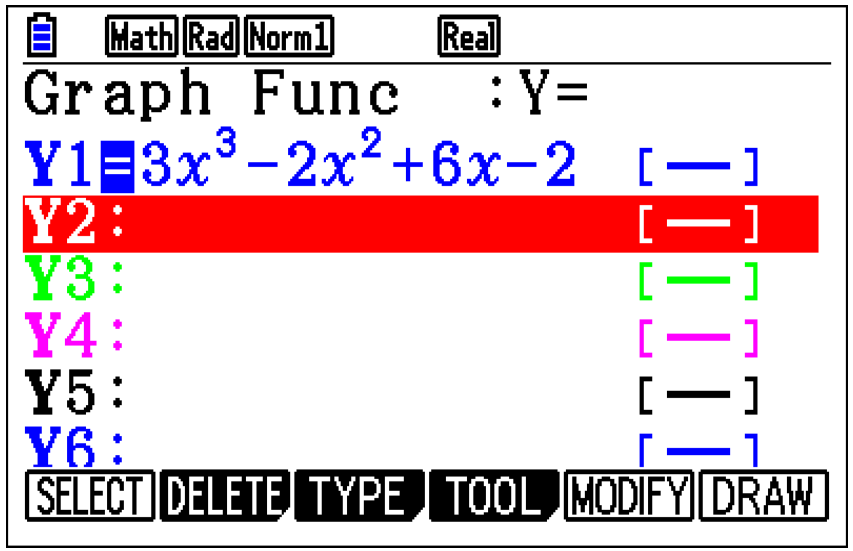
(A) $\left(-\infty, \frac{2}{9}\right)$

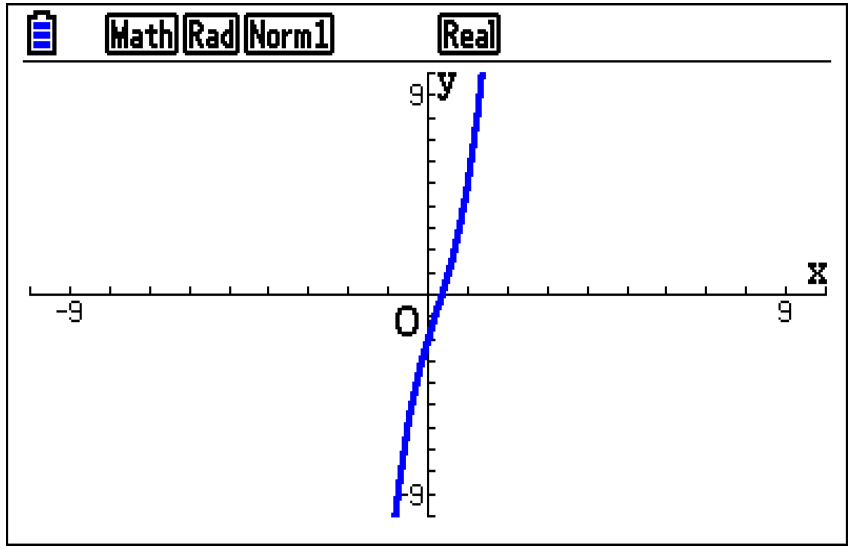
(B) $\left(\frac{2}{9}, \infty\right)$

(C) $\left[0, \frac{2}{9}\right]$

(D) $(-\infty, \infty)$

(E) None of the above

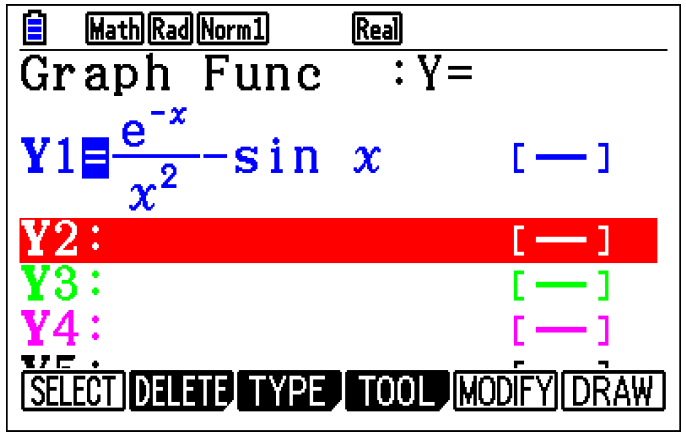


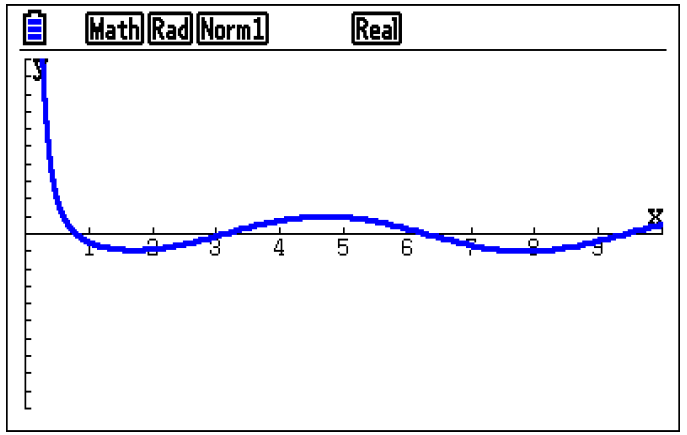


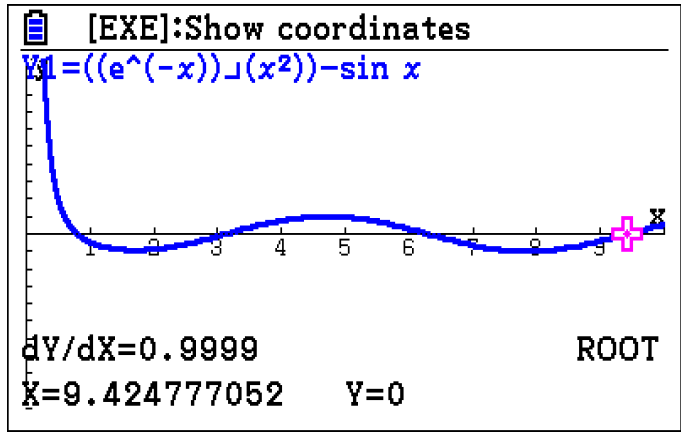
The first derivative of a function, f, is given by $f'(x) = \frac{e^{-x}}{x^2} - \sin x$. How many critical values does f have on the open interval $(0,10)$?

(A) One
(B) Two
(C) Three
(D) Four
(E) Five

Answer : (D) Four (intersection with x-axis)



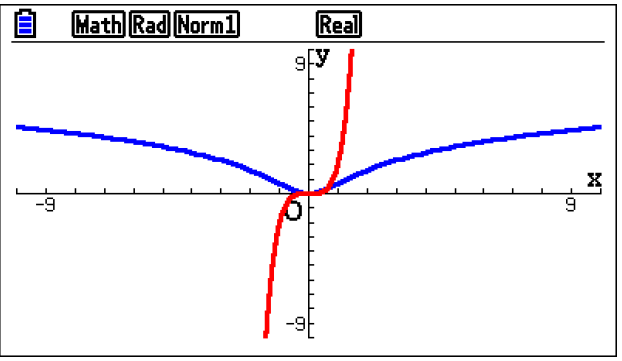


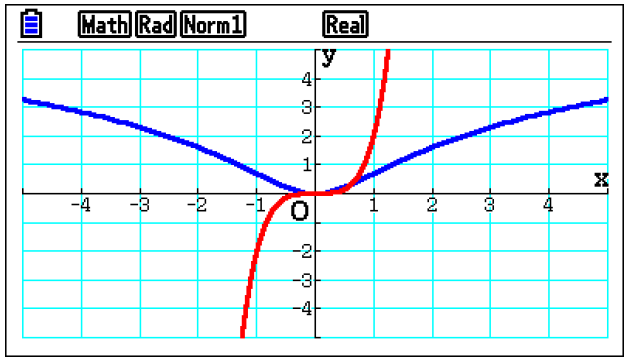


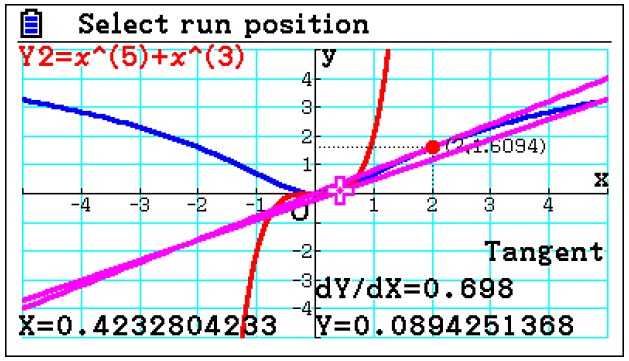
Let f be the function defined by $f(x) = \ln(x^2 + 1)$, and let g be the function defined by $g(x) = x^5 + x^3$. The line tangent to the graph of f at $x = 2$ is parallel to the line tangent to the graph of g at $x = a$, where a is a positive constant. What is the value of a ?

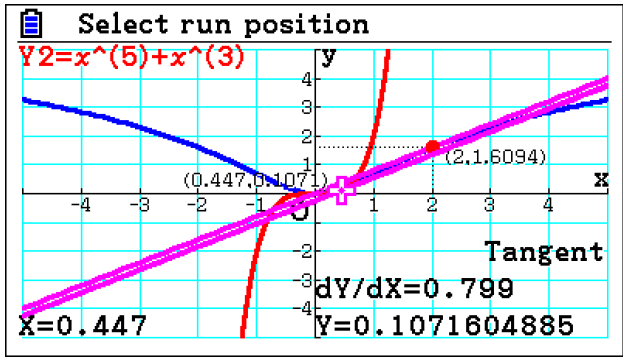
(A) 0.246 (B) 0.430 **(C) 0.447** (D) 0.790

Graph the two functions then for f(x) sketch the tangent line after that you can sketch parallel tangent line for g(x).



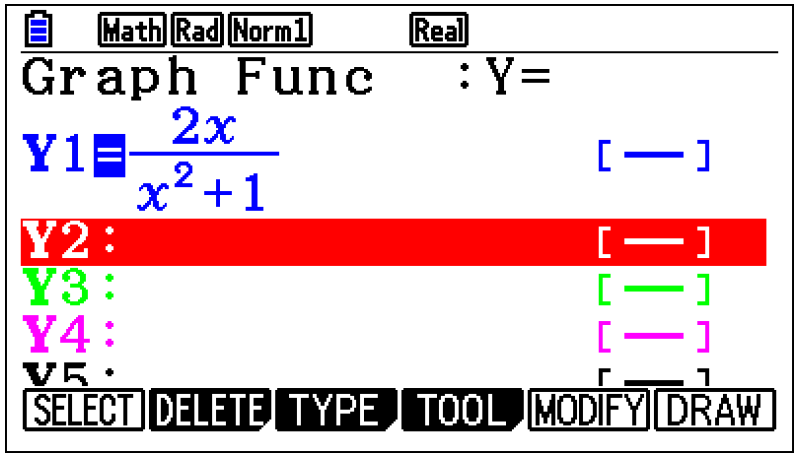


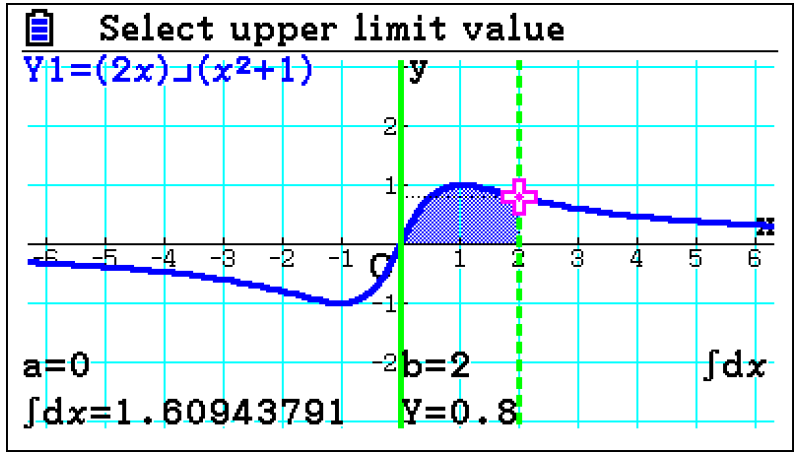


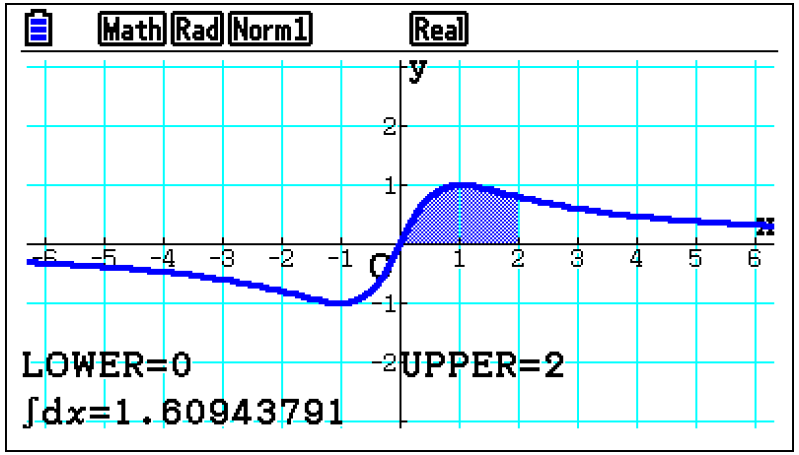


Let $f(x) = \dfrac{2x}{x^2+1}$.

Find the area under the curve of $f(x)$, from $x = 0$ to $x = 2$.

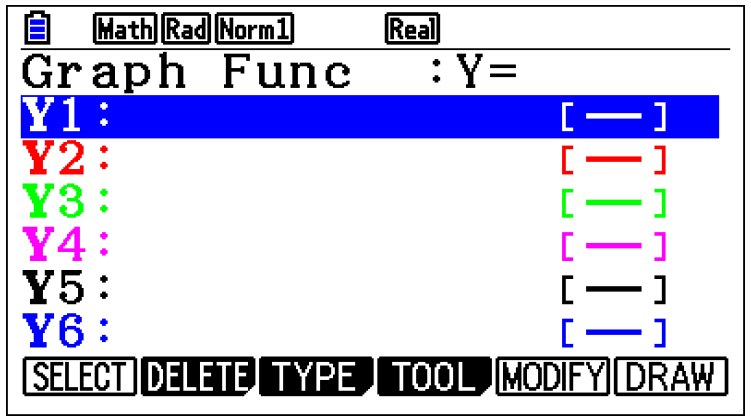


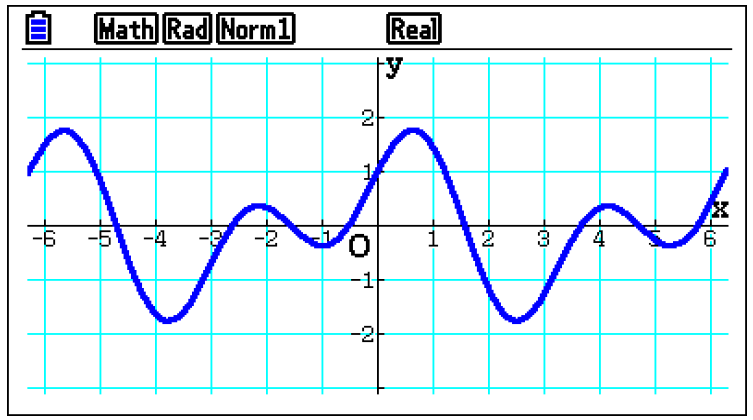


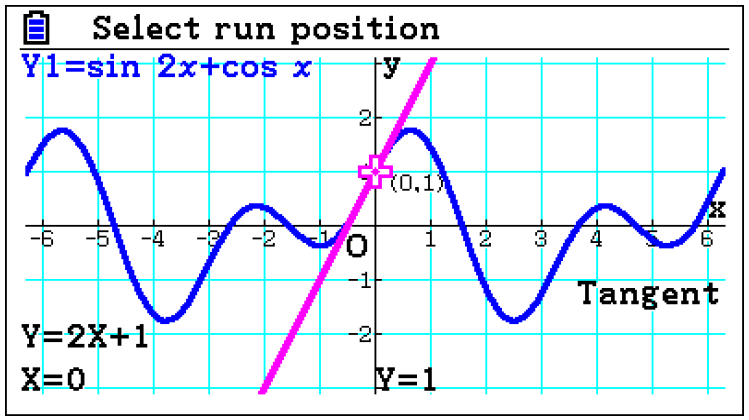


Let $f(x) = \sin 2x + \cos x$.

Find the equation of the tangent of the graph of f at $x = 0$.



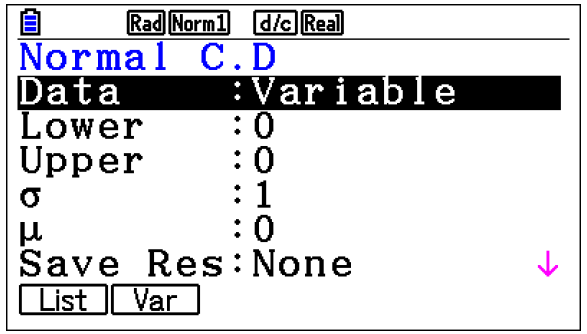


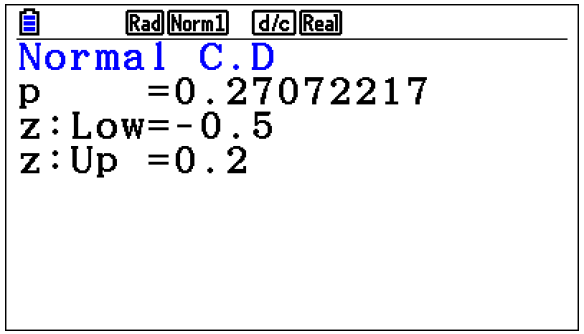


The amount of sugar in 100 grams of grapes, S, follows a normal distribution with a mean of 16 grams and standard deviation 1 gram.

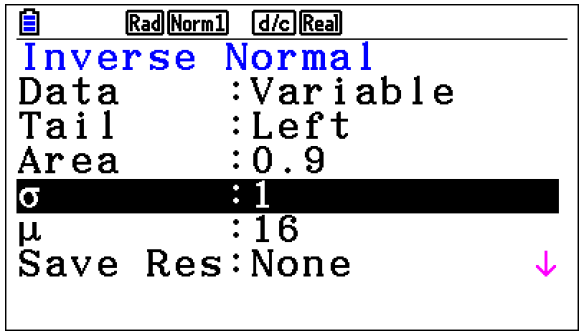
(a) Find the probability that 100 grams of grapes chosen at random contains between 15.5 grams and 16.2 grams of sugar.

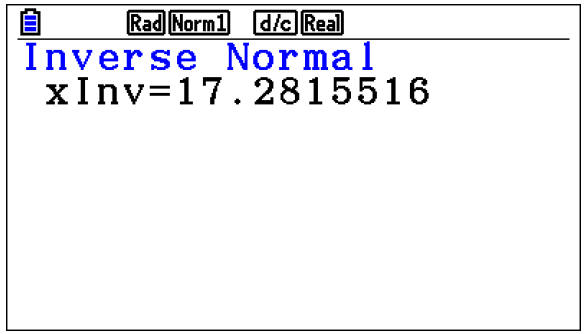
(b) 90% of randomly chosen 100 gram portions of grapes contain less than k grams of sugar. Calculate the value of k.





Answer : (a) = 0.27



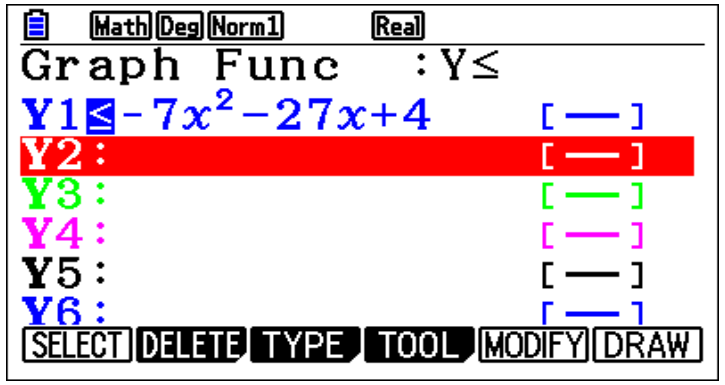


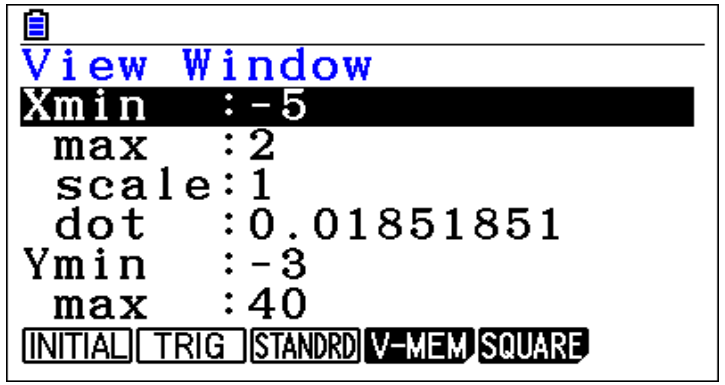
Answer : (b) = 17.28

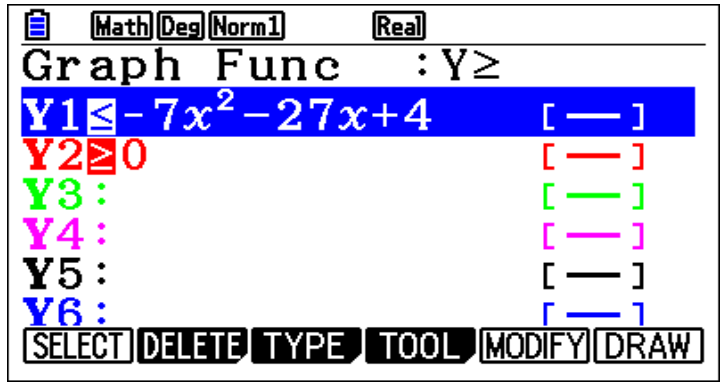
For what values of x is the following inequation true?

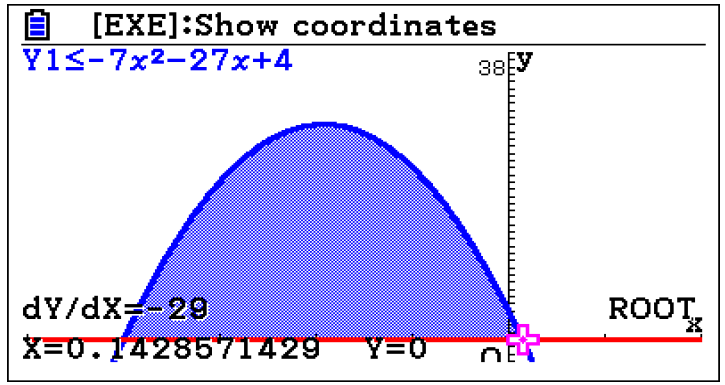
$$-7x^2 - 27x + 4 \geq 0$$

Answer : x {-4 , 0.143}





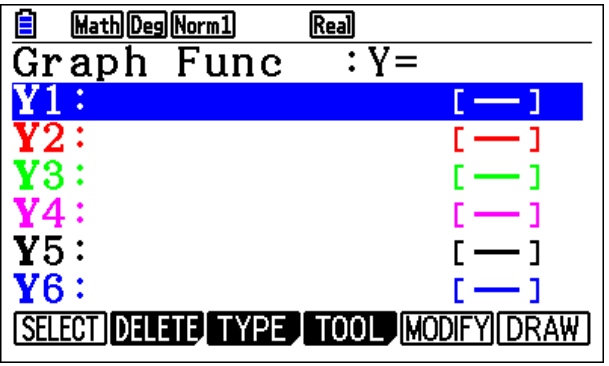


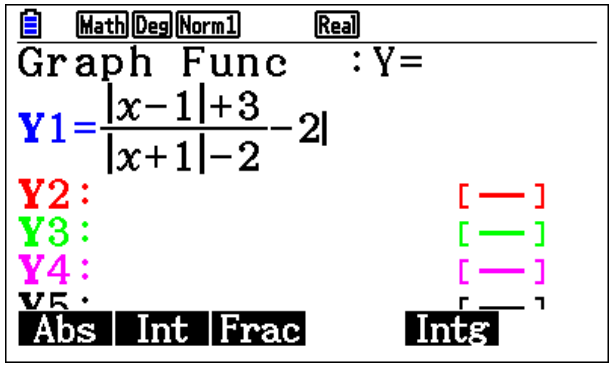


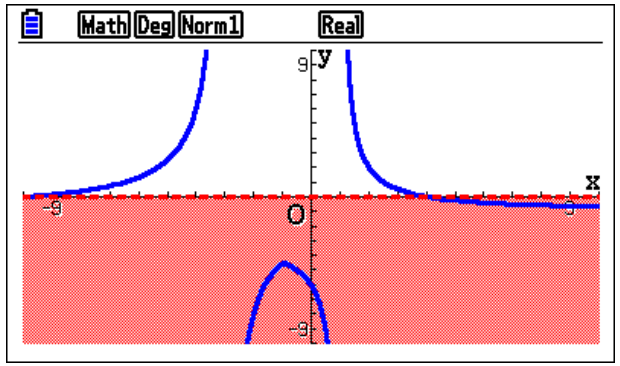
Solve the following inequation

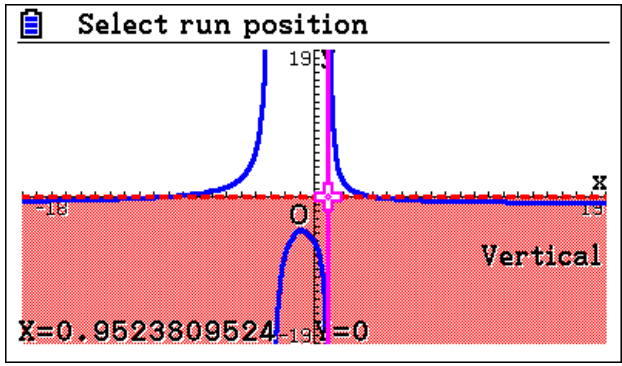
$$\frac{|x-1|+3}{|x+1|-2} < 2$$

$$\frac{|x-1|+3}{|x+1|-2} - 2 < 0$$



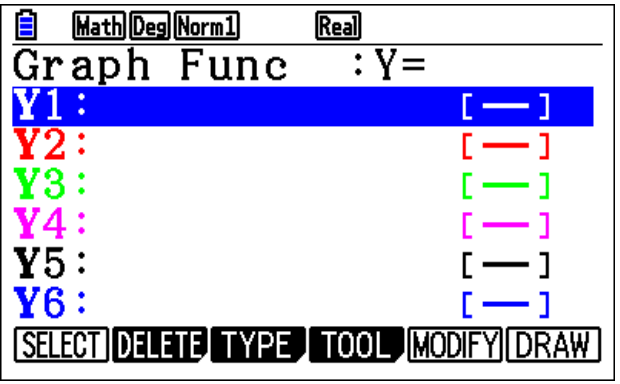


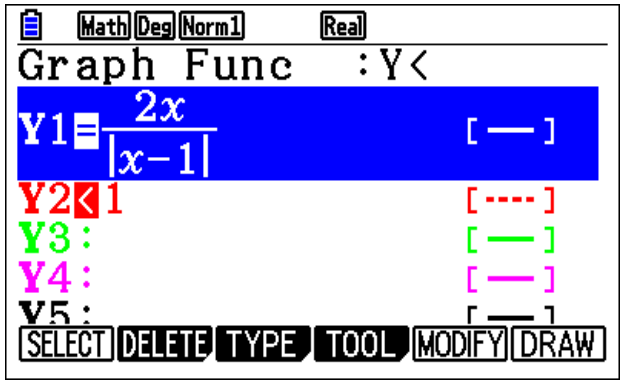


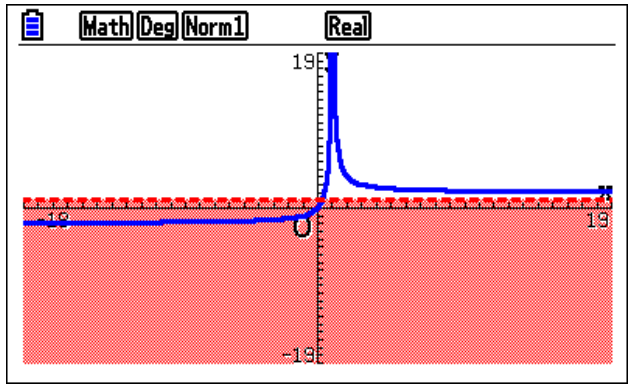


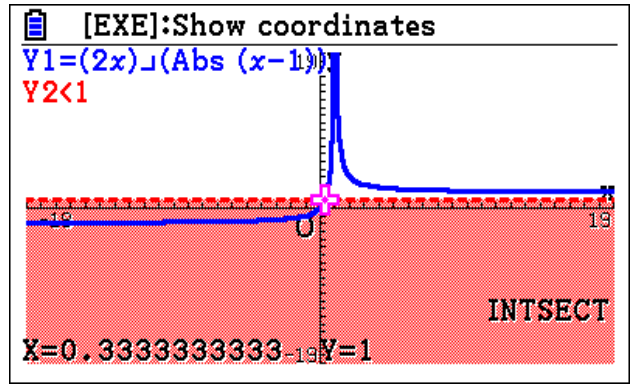
Answer : by using trace F1 and see where is the function negative the intervals of x are : $(-\infty, -10) \cup (-3,1) \cup (4, \infty)$

Find all values of x that satisfy the inequality $\dfrac{2x}{|x-1|} < 1$



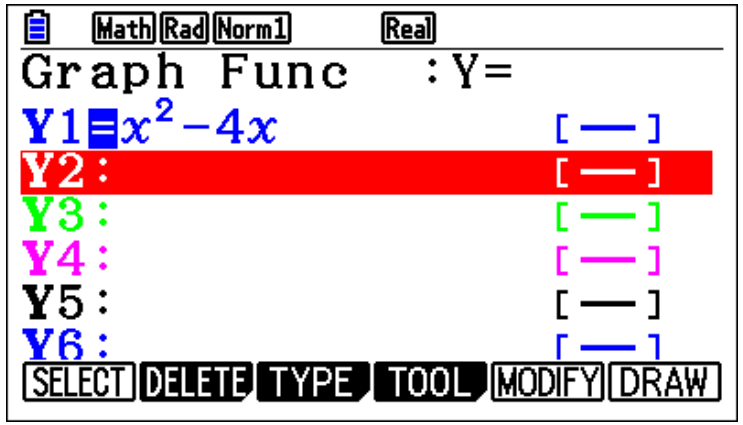


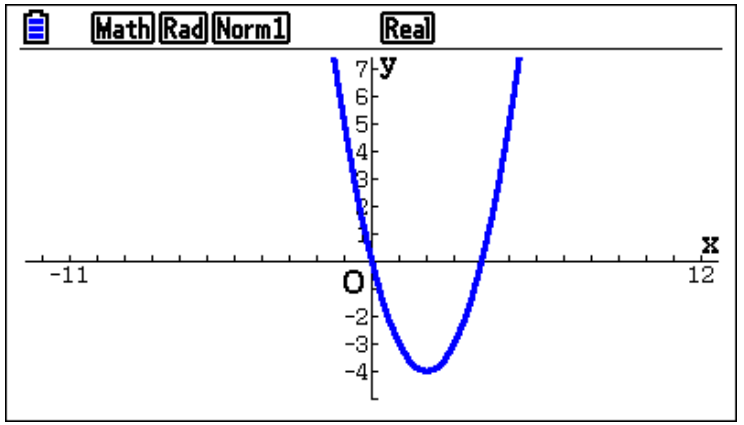


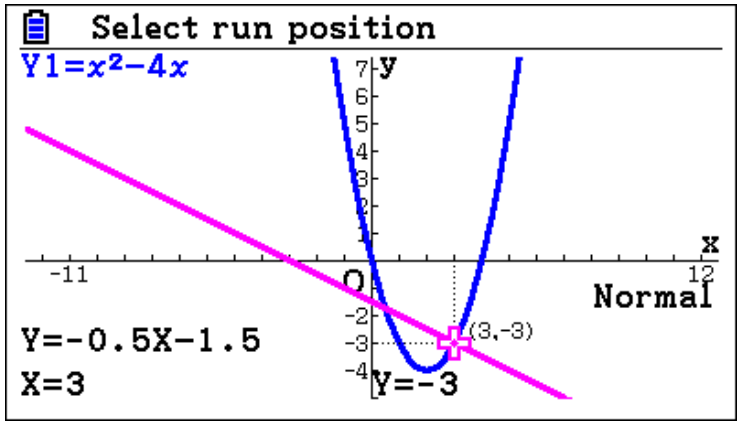


Answer : by using trace F1 and see where the function is negative , the intervals of x are : $(-\infty, \frac{1}{3})$

The normal to the curve $y = x^2 - 4x$ at the point $(3, -3)$ intersects the x-axis at point P and the y-axis at point Q. Find the equation of the normal and the coordinates of P and Q.



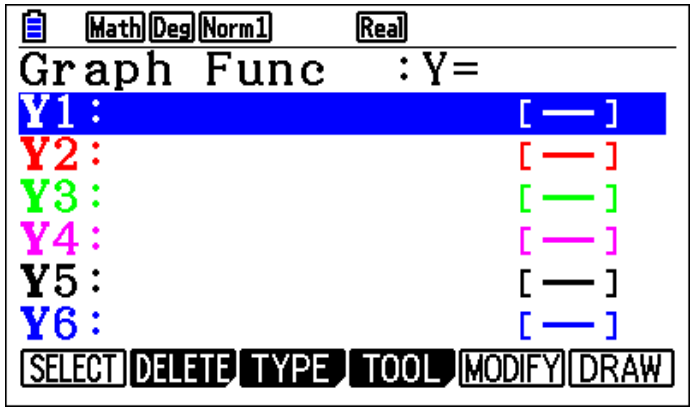


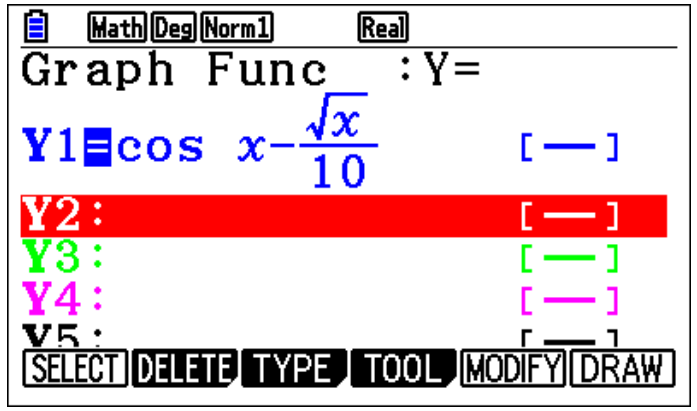


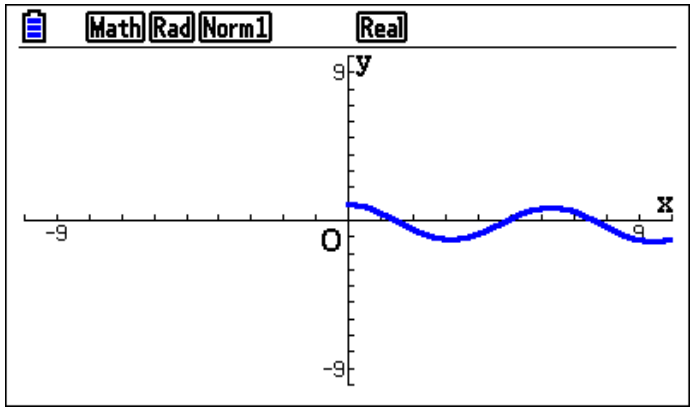
Answer : *y=-0.5x-1.5*

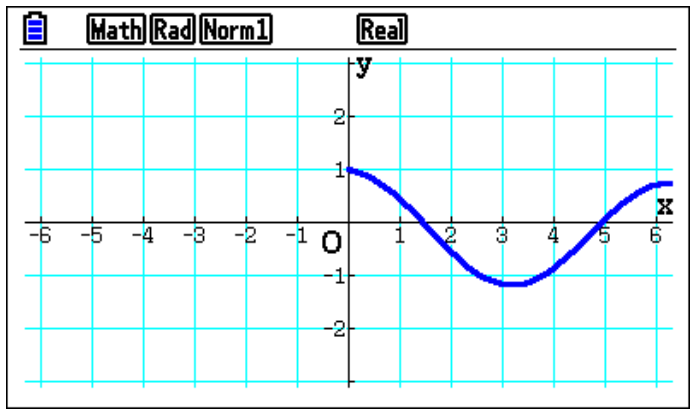
Consider the function $f(x) = \cos x - \dfrac{\sqrt{x}}{10}$.

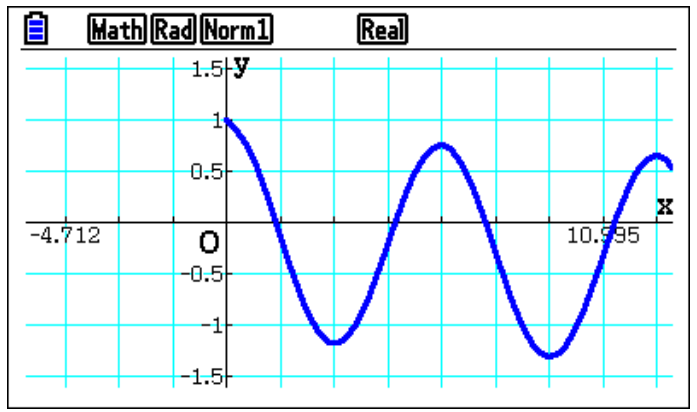
Graph this function with different windows, the angles should be radians.

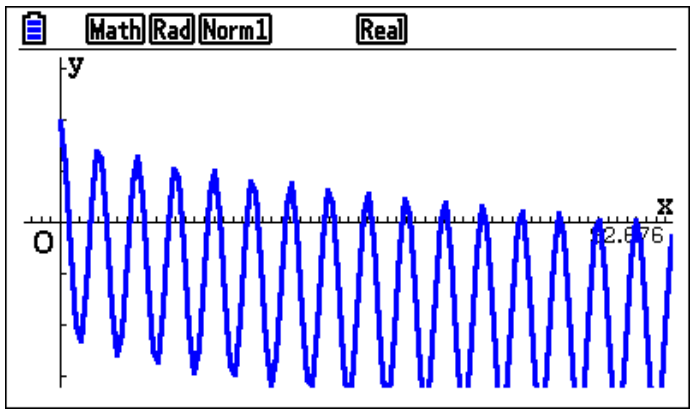










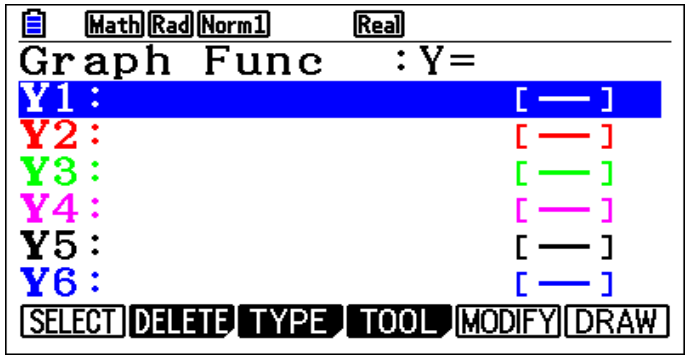


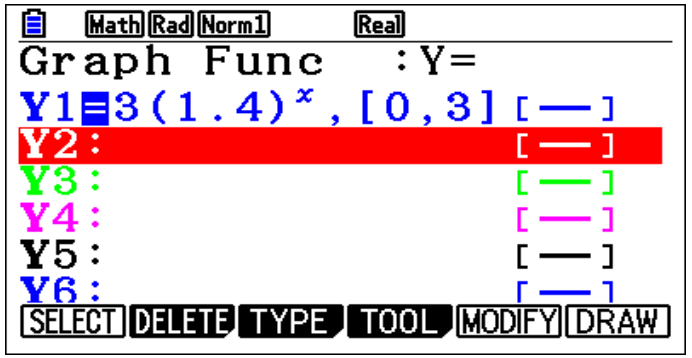
Consider the function $f(x) = 3(1.4)^x$

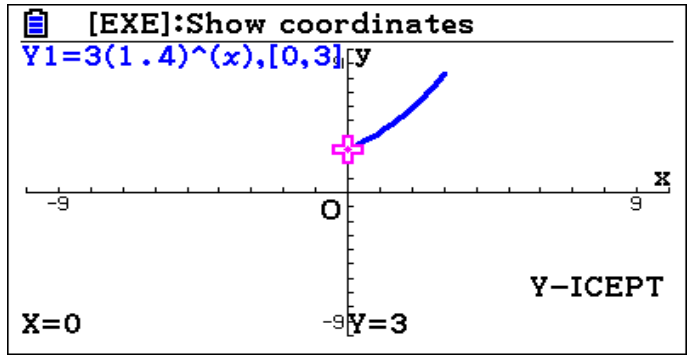
a. Sketch the graph of the function for the domain $0 \le x \le 3$.
b. Write down the coordinates of the y-intercept.
c. On the same grid, draw the graph of the function $g(x) = 4 - 3x$.
d. For what values of x is $f(x) = g(x)$?

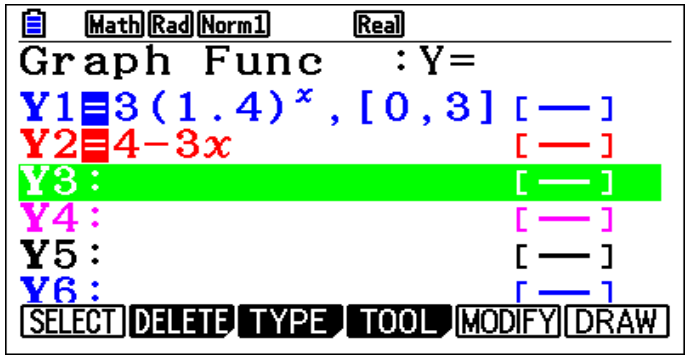
Answer : (b) y-intercept = 3

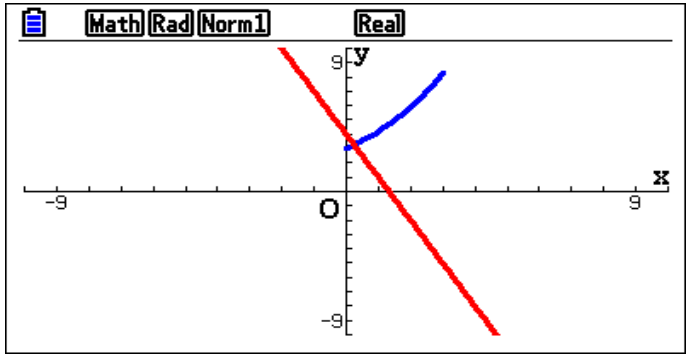
(d) f(x)=g(x) at (0.246, 3.259)

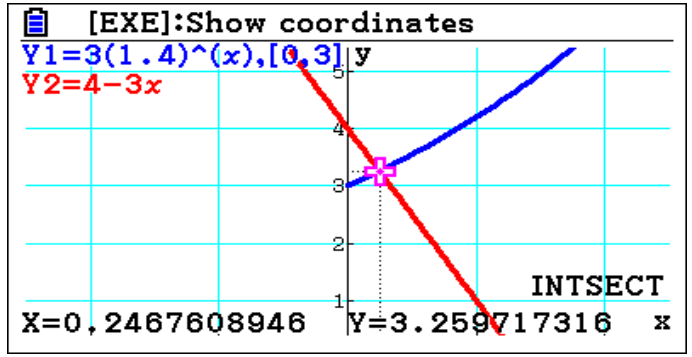












Consider the function $y = -x^2 + 2x + 5$.

(a) Find $\frac{dy}{dx}$.

(b) Write down the value of the derivative at $x = -1$.

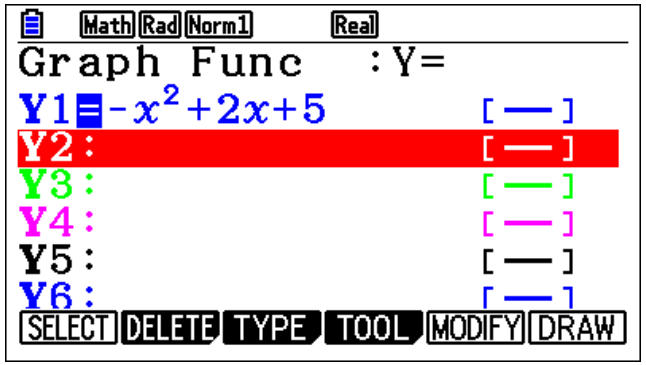
(c) Find the equation of the tangent to the function at $x = -1$.

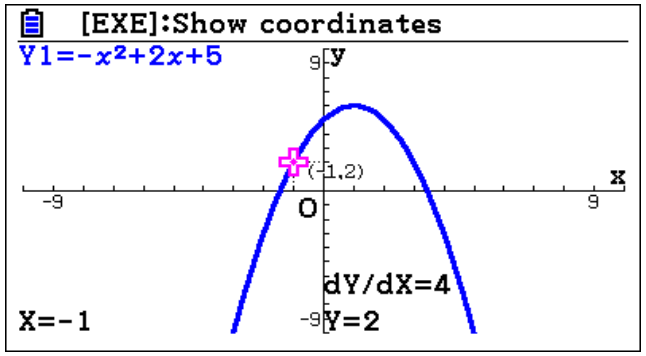
(d) Find the equation of the normal to the function at $x = -1$.

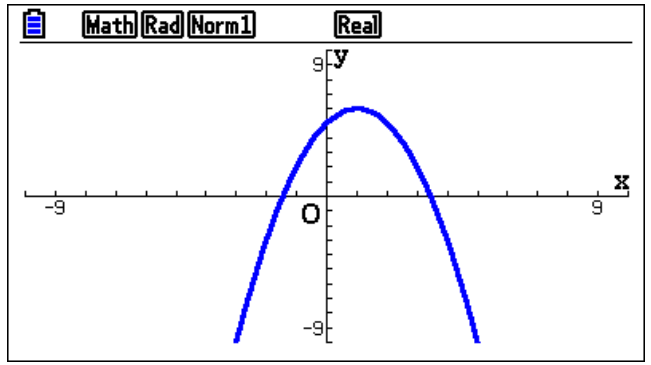
Answer : (b) at x=-1 the derivative =4

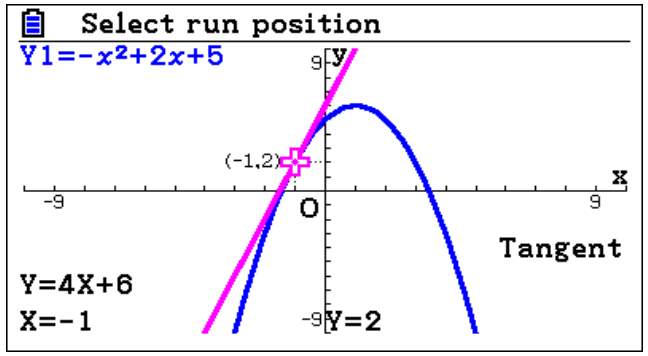
(c) tangent $y = 4x + 6$

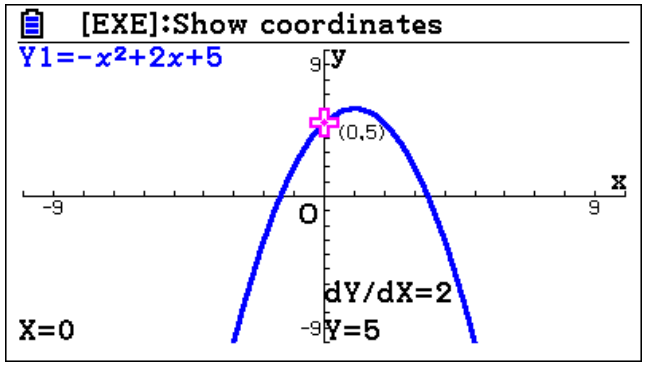
(d) normal $y = -0.25x + 1.75$

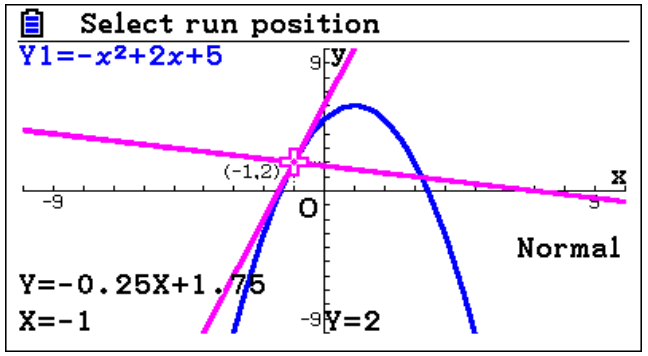










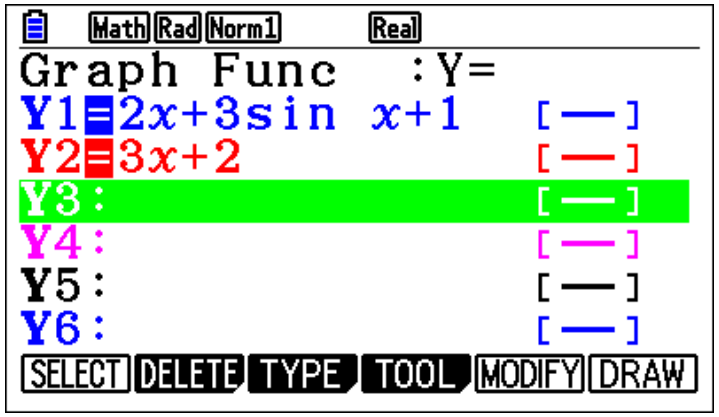


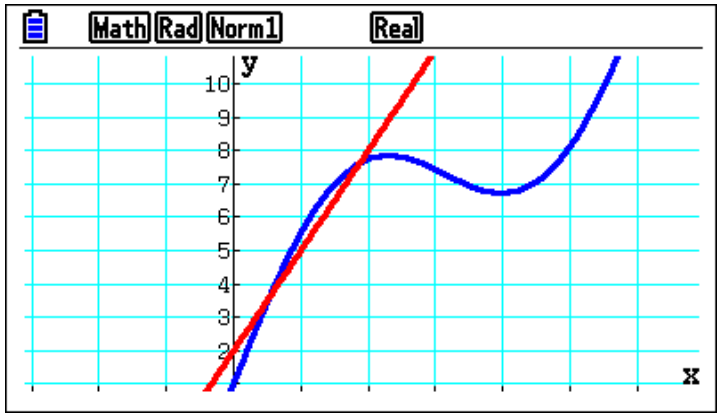
The shaded region is enclosed between the curves $y = 2x + 3\sin x + 1$ and $y = 3x + 2$ for $x \geq 0$.

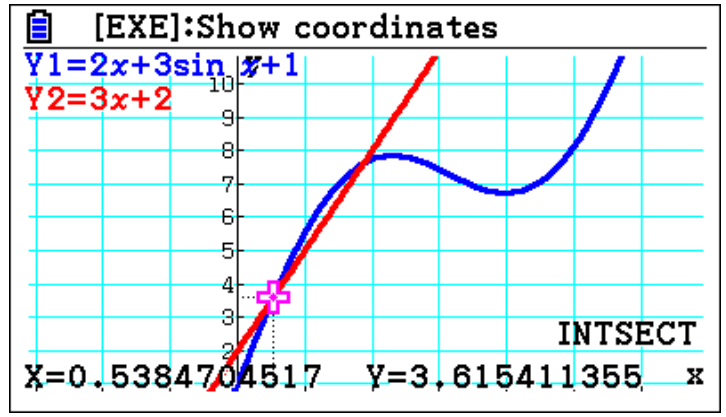
a. Write down the coordinates of the points of intersection.
b. Find the area of the region.

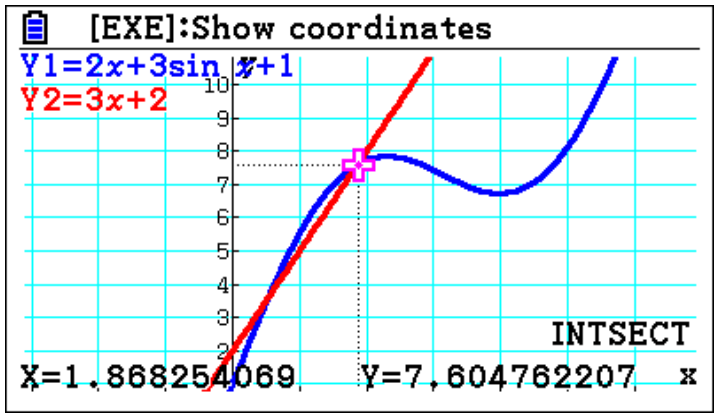
Answer : (a) (0.538 , 3.615)

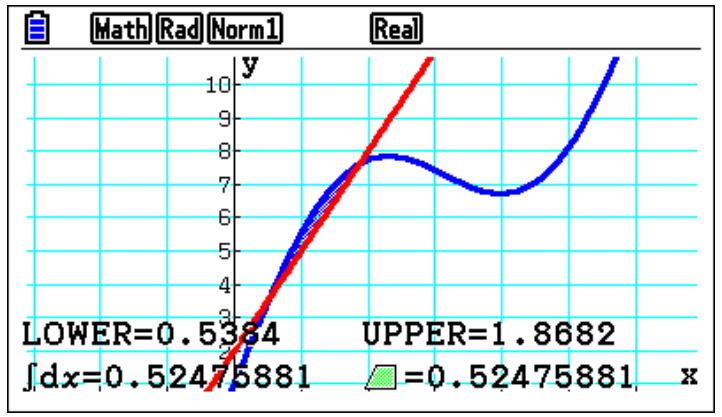
(b) area = 0.5245

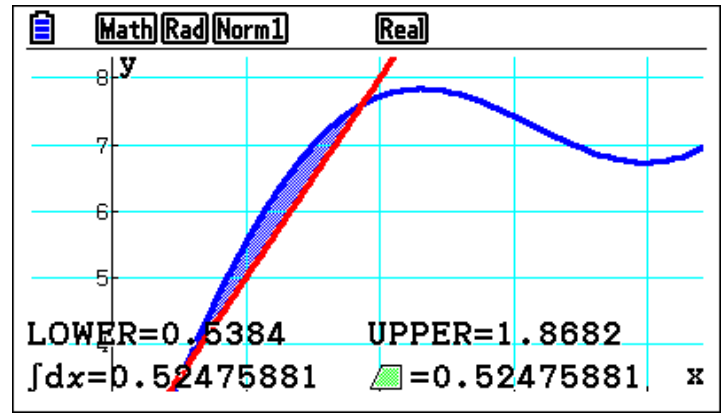












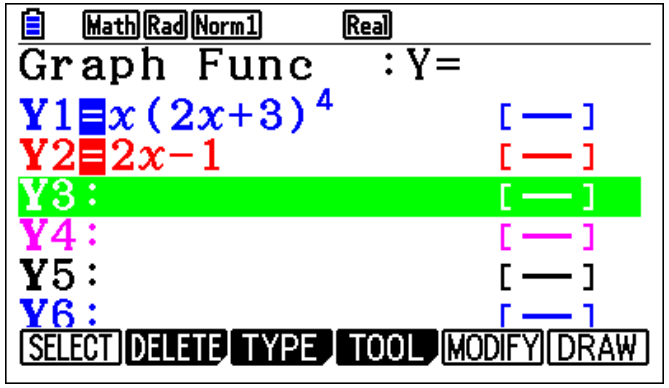
Consider the function $f(x) = x(2x+3)^4$

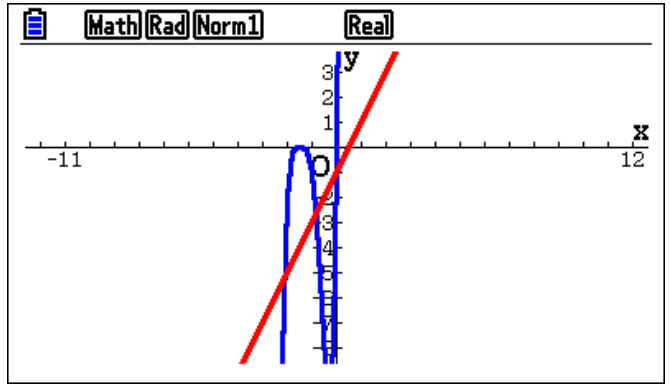
a. Solve the inequality $f(x) \geq 2x - 1$

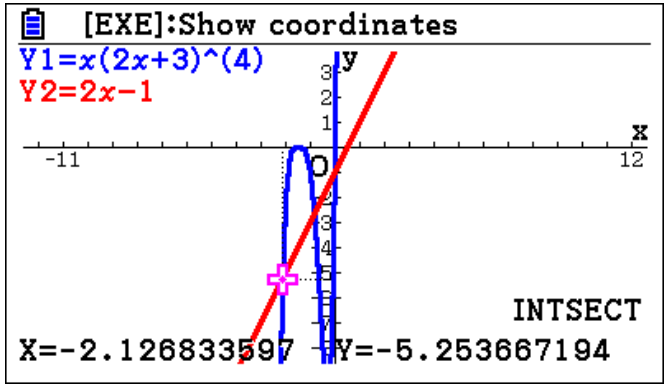
b. Find the area enclosed between the curve representing $f(x)$ and $y = 2x - 1$.

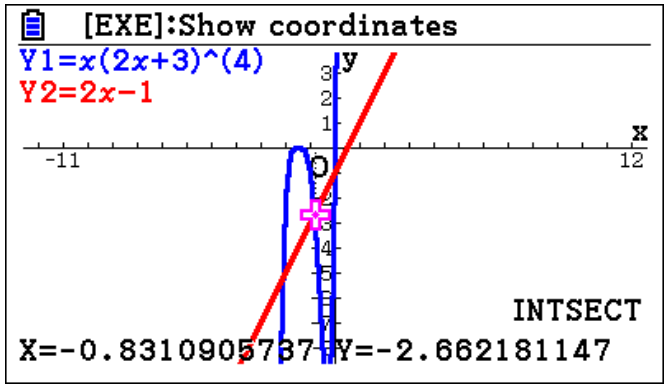
Answer : (a) $(-2.1268, -0.8311) \cup (-0.0131, \infty)$

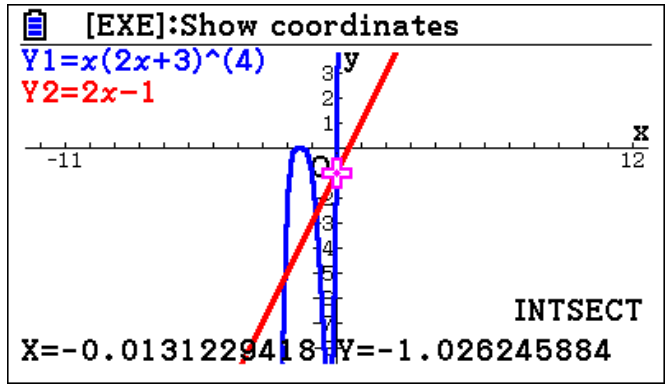
(b) area = 4.156

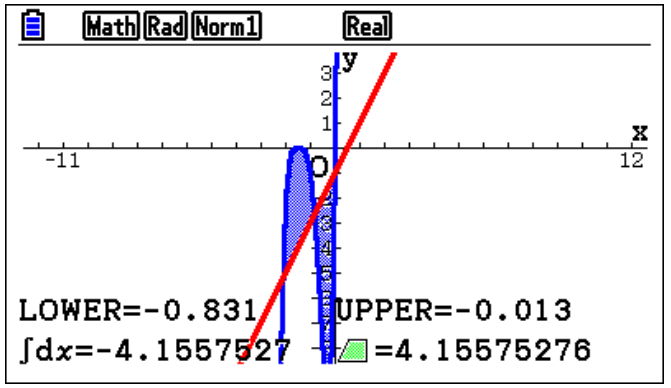












The velocity of a particle in ms−1 is given by $v = e^{2\sin 2t} - 1$, for $0 \le t \le 5$.

(a) Sketch the graph of v.

(b) Write down the positive t-intercepts.

(c) (i) Find the acceleration when $t = 0$.

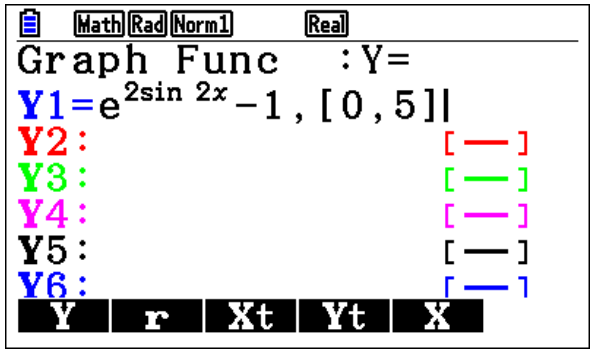
(ii) When is the acceleration the most?

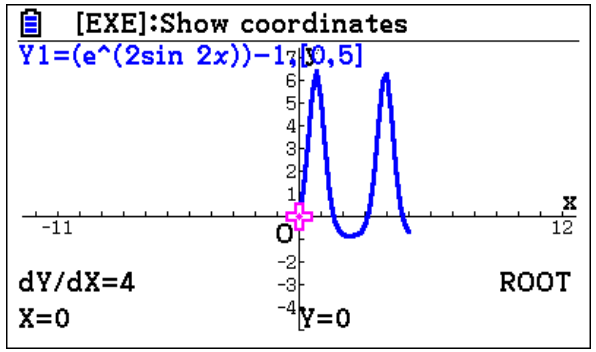
Notes: Angle radian not degree

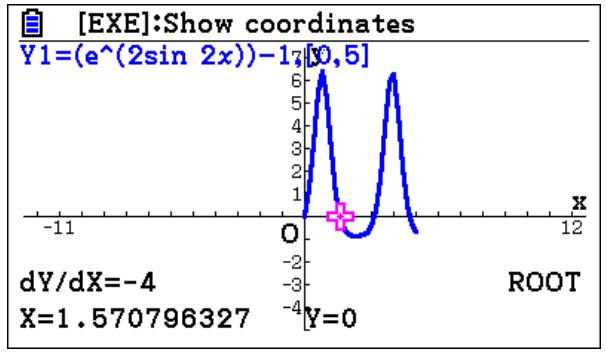
To draw the derivative, we put the interval [0,5] but we delete it from the main function

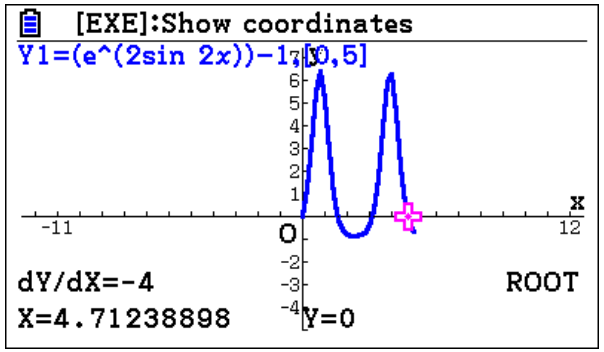
Answer : (b) t={ 0 , 1.571 , 4.7124}

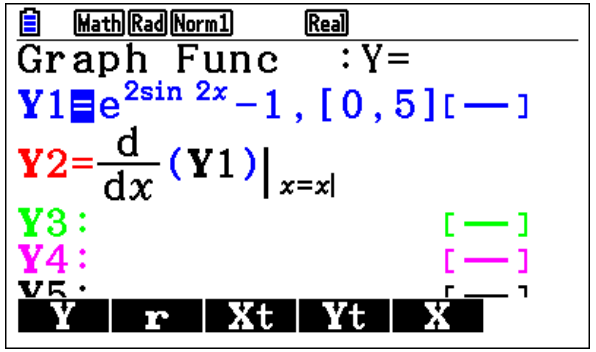
(c)i t=0 then a=4 (c)ii max acceleration = 11.912

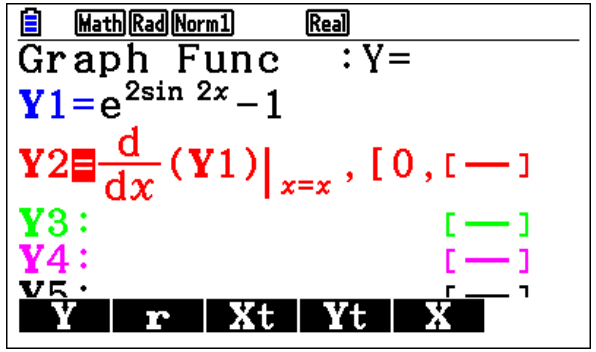


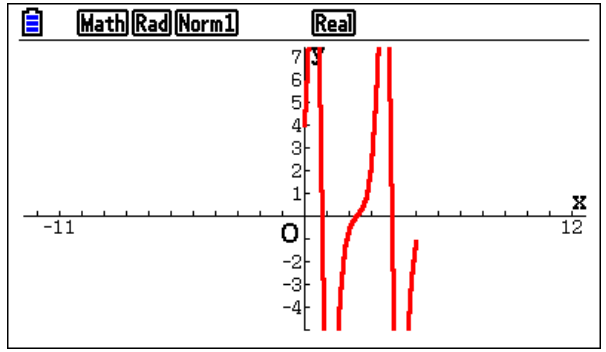


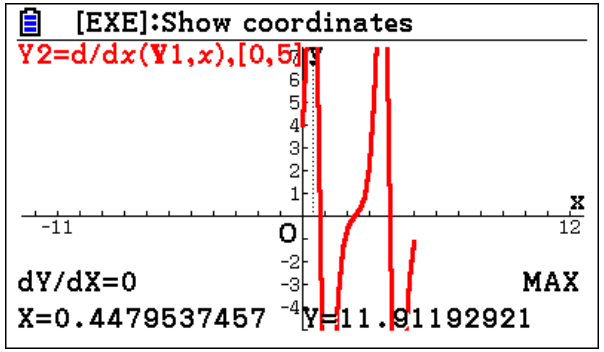












18. The temperature, in degrees Fahrenheit (°F), of water in a pond is modeled by the function H given by $H(t) = 55 - 9\cos\left(\frac{2\pi}{365}(t+10)\right)$, where t is the number of days since January 1 $(t = 0)$. What is the instantaneous rate of change of the temperature of the water at time $t = 90$ days?

(A) 0.114°F/day

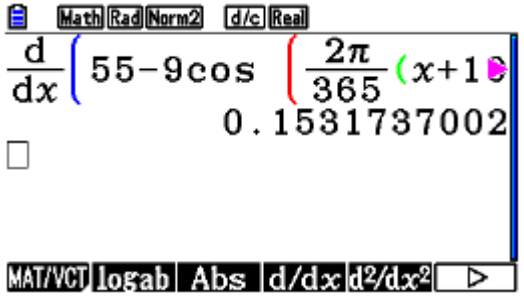
(B) 0.153°F/day

(C) 50.252°F/day

(D) 56.350°F/day

Solution using FX-CG50:

Instantaneous rate is the derivative at the point



OPTN F4 F2 5 5 − 9 cos (2 SHIFT ×10^x 3 6 5 ▶ (X,θ,T + 1 0)) ▶ 9 0 EXE

15. A rain barrel collects water off the roof of a house during three hours of heavy rainfall. The height of the water in the barrel increases at the rate of $r(t) = 4t^3e^{-1.5t}$ feet per hour, where t is the time in hours since the rain began. At time $t = 1$ hour, the height of the water is 0.75 foot. What is the height of the water in the barrel at time $t = 2$ hours?

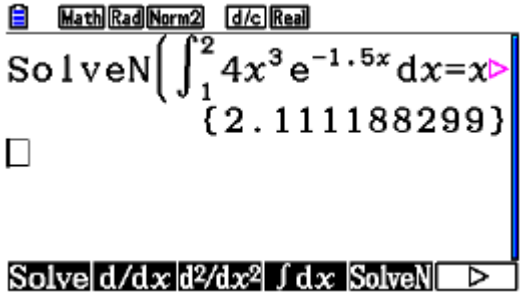
(A) 1.361 ft

(B) 1.500 ft

(C) 1.672 ft

(D) 2.111 ft

Solution using FX-CG50:



OPTN F4 F5 F4 4 X,θ,T ^ 3 ▶ SHIFT ln (−)

1 • 5 X,θ,T ▼ 1 ▲ 2 ▶ SHIFT • X,θ,T (−) 0 • 7 5) EXE EXIT

If rate unit is feet per hour then integral of rate will give a unit in feet

Apply $\int_a^b r(t)dt = f(b) - f(a)$