Algebra 2 Cheat Sheets!

(Shhhhhh....)

Graphing Absolute Value equations (Cheat Sheet)

Steps:

1: set inside = to zero.
2: solve for x.
3: create a table with the found x value in the middle.
4: Plug x back into the equation to find y. (This is the vertex coordinate.)
5: choose 2 more x values, one on either side of the x you found.
6: Find y values.
7: Graph 3 points.

Example: **Graph y = |x + 5|** **(Absolute Value)**

1: x + 5 = 0
2: **x = -5**

3:

x	y
-5	

4:

x	y
-5	0

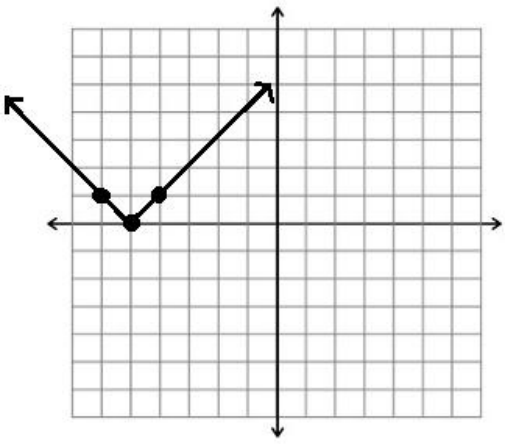
5:

x	y
-6	
-5	0
-4	

6:

x	y
-6	1
-5	0
-4	1

7: Plot and connect.



Graphing Quadratics (Cheat Sheet)

Steps:

1: set inside = to zero.
2: solve for x.
3: create a table with the found x value in the middle.*
4: Plug x back into the equation to find y. (This is the vertex coordinate.)
5: choose 2 more x values, one on either side of the x you found.
6: Find y values.
7: Choose 1 more x value and find its y value.
8: Plot all 4 points.
9: Use symmetry to find a 5th point.

*Note here that our table has more than 3 rows. This is because quadratics, unlike absolute value equations, do not grow linearly in each direction.

Example: **Graph $y = (x - 1)^2 - 2$ (Quadratic)**

1: $x - 1 = 0$
2: $x = 1$

3:

x	y
1	

4:

x	y
1	-2

5:

x	y
0	
1	-2
2	

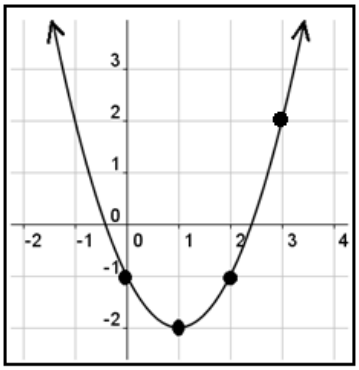
6:

x	y
0	-1
1	-2
2	-1

7:

x	y
0	-1
1	-2
2	-1
3	2

8:



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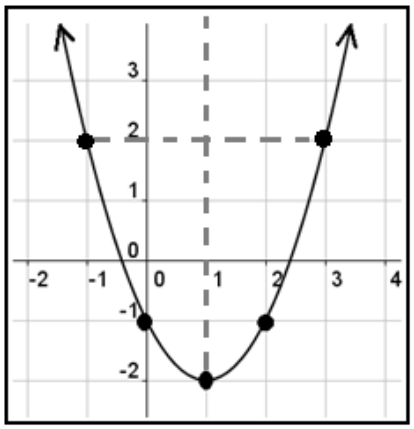


Graphing Radicals (square roots) Cheat Sheet

Perfect Squares: 0 1 4 9

Example: Graph $y = \sqrt{x - 5} + 3$ (radical)

Step 1: Make a table:

x	y

Step 2: Set "inside" $(x - 5)$ expression equal to each **perfect square** number above....

$x - 5 = 0$ $x - 5 = 1$ $x - 5 = 4$ $x - 5 = 9$

... and solve for each x.

$x = 5$ $x = 6$ $x = 9$ $x = 14$

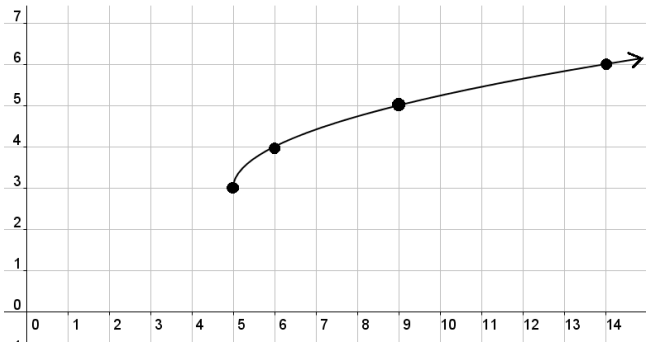
Step 3: Fill in your table with the x values you just found:

x	y
5	
6	
9	
14	

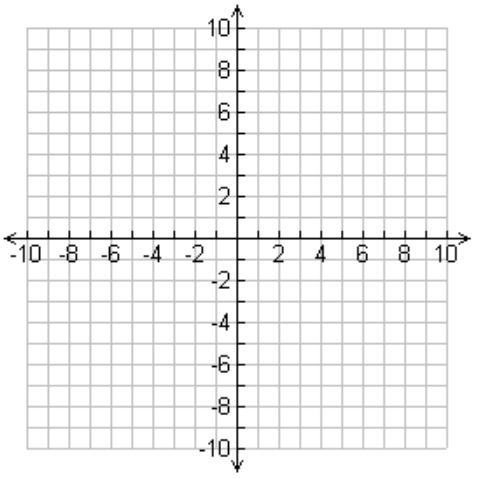
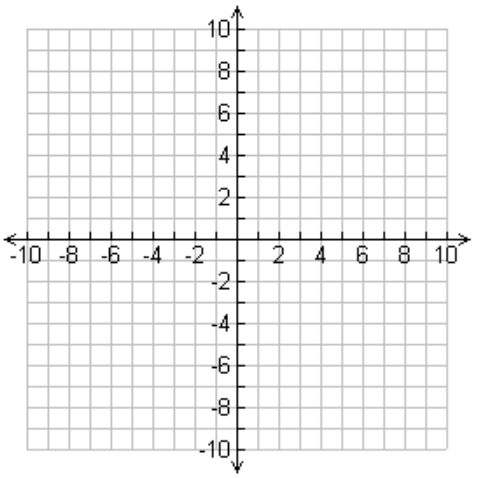
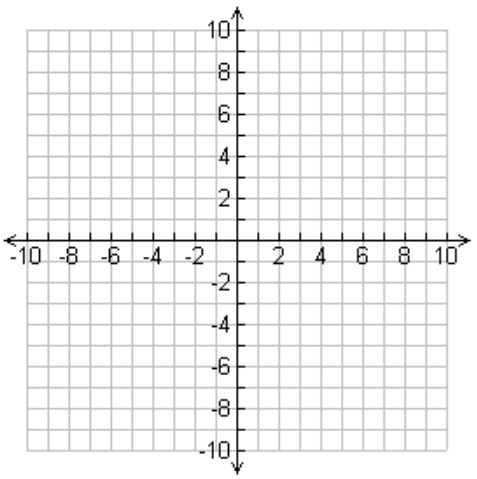
Step 4: Find the y values (plug back in).

x	y
5	3
6	4
9	5
14	6

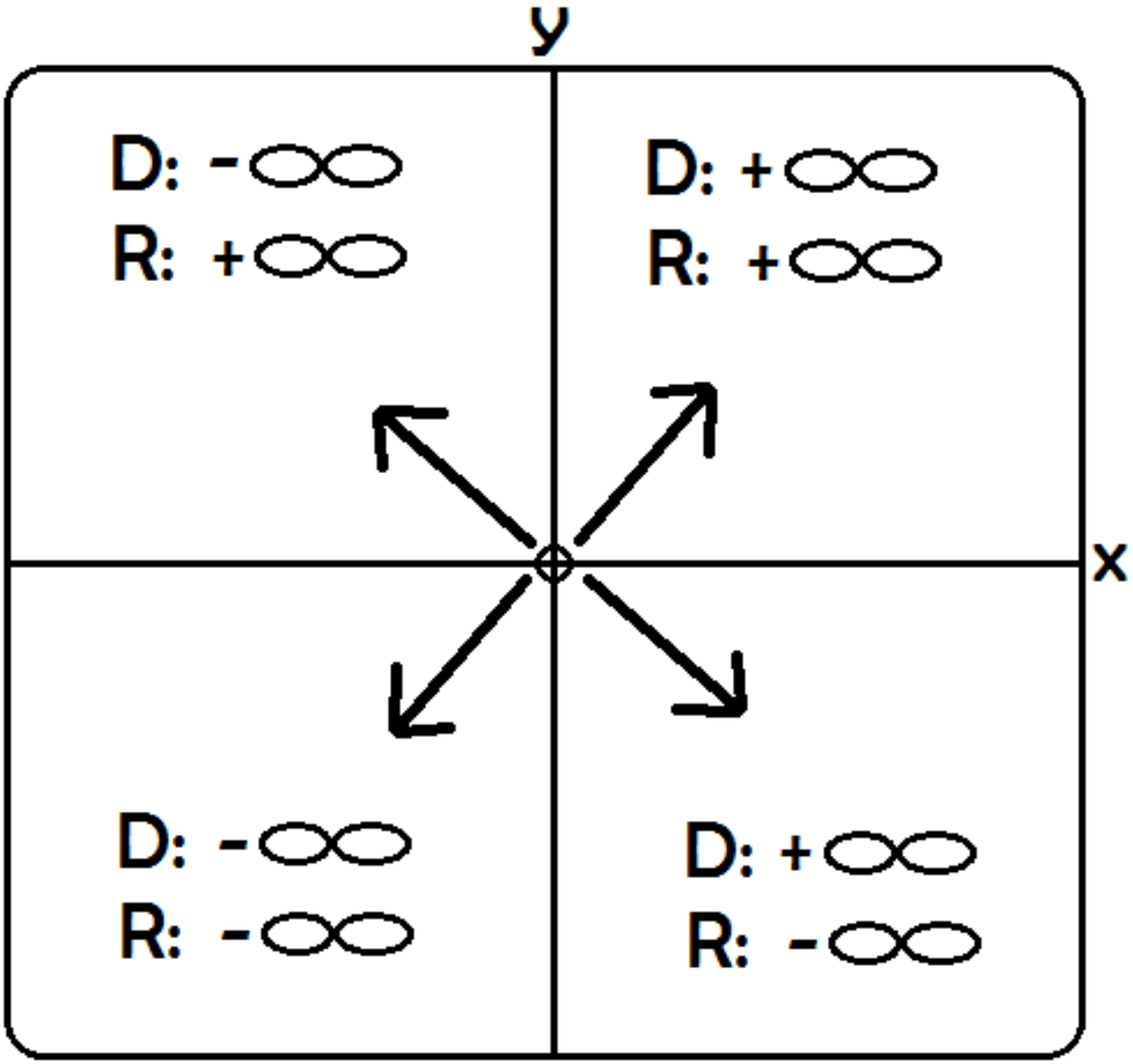
Step 5: Plot points and connect.



How to Graph Parabolas, radicals and absolute value on the calculator

Function	How to graph on the calculator	Graph
Parabola $Y = x^2 + x - 2$	**Y =** **XTΘN** **^ 2 +** **XTΘN** **– 2** **GRAPH**	
Radical $Y = \sqrt{x+3} - 2$	**Y =** **2nd** $\sqrt{}$ **x^2** **XTΘN** **+ 3) – 2** **GRAPH**	
Absolute Value $Y = \lvert x + 2 \rvert - 4$	**Y =** **MATH** → **NUM** **1:abs(** **ENTER** **XTΘN** **+ 2) – 4** **GRAPH**	

Where Domain and Range are Infinite



How to Factor "no GCF" Trinomials $y = Ax^2 + Bx + C$

Steps: **Example:** $8x^2 + 10x + 3$

Step 1: Identify A, B and C: A = **8** B = **10** C = **3**

Step 2:
Multiply **AC.** This is your **Magic Number**: **(8)(3) = 24**

Step 3:
Factor your Magic Number (ignoring any – signs for now):

24
1 • 24
2 • 12
3 • 8
4 • 6

Step 4a: Follow the flowchart:

C is ...	+		-	
B is ...	+	-	+	-
	both Magic Number factors are **+**	**both** Magic Number factors are **-**	the **bigger** Magic Number factor is **+**	the **bigger** Magic Number factor is **-**

Step 4b:
Add **+** and **–** signs to each pair in your Magic Number factor list, according to the chart.

Step 5:
Question: "Which factor pair adds to get your **B**?" +4 • +6

Step 6:
Rewrite your trinomial, **replacing B** with the numbers you boxed: $8x^2 + 4x + 6x + 3$

Step 7:
Add ( ). $(8x^2 + 4x) + (6x + 3)$

Step 8:
Factor each ( ): $4x(2x + 1) + 3(2x + 1)$

hint: Your two ( ) should always be the same. If one is + and one is -, it's because one of your factors from step 6 was -. Usually your first ( ) will be the correct one. To check, distribute backwards to see if you get back to step 6. If not, switch the sign in the 2nd ( ).

Step 9:
Rewrite to finish.
One ( ) is the stuff on the inside.
One ( ) is the stuff on the outside. $(2x + 1)(4x + 3)$

You're done! You factored a trinomial!

Steps to Graphing Complicated-looking Polynomial Functions like $y = x(x + 2)(x + 1)$

1: Factor the expression, if necessary.

2: Solve to find the zeros.

3: Plot the zeros on the x axis.

4: Determine the **degree**.
How many x's in factored form?
If an odd number (1, 3, 5, etc) then degree is **odd**.
If an even number (2, 4, 6, etc) then the degree is **even**.

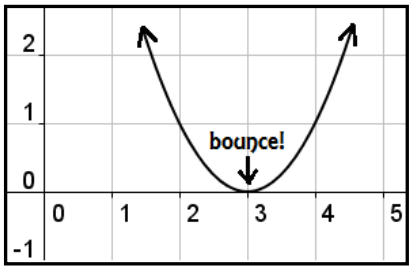
a value	+	-
odd	↗ ↙	↖ ↘
even	↑ ↑	↓ ↓

5: Determine the **a value**.
Is there a – sign to the left of the =? If no, then the **a value is +**. If yes, then the **a value is -.**

6: Draw arrows from the leftmost and rightmost zeros, based on the arrow chart.

7: Multiplicity? If no, there is no "bounce". Continue "snaking through" the zeros.

If "yes" for multiplicity, as in $\mathbf{y = (x - 3)^2}$,
(it's squared) there is a "bounce" off the x axis! →



Example: **Graph $y = x^3 + 3x^2 + 2x$**

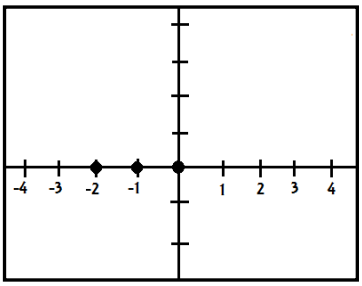
1: Factor the expression.

$y = x(x^2 + 3x + 2)$
$y = \mathbf{x(x + 2)(x + 1)}$

2: Solve to find the zeros.

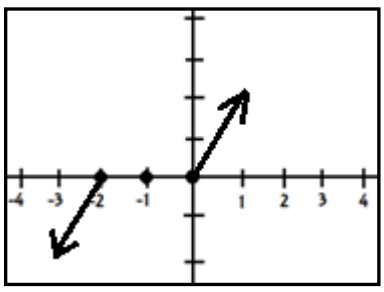
$x = \mathbf{0}$, $x = \mathbf{-2}$, $x = \mathbf{-1}$

3: Plot the zeros on the x axis.

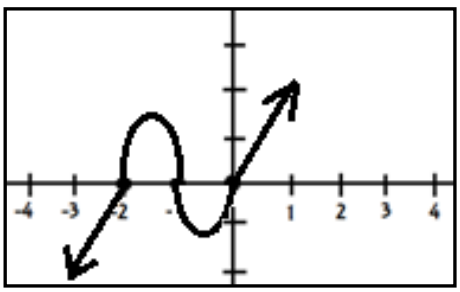


4 and 5: Determine the **degree and a value**.
"3 x's in factored form, so degree 3 (odd)"
"no – to the left of =, so a is +"

6:
Draw arrows from left and right zeros.



7:
No multiplicity, so "snake through" the zeros.



Patterns for Graphing

$y = |x|$ $y = x^2$ $y = x^3$ $y = \sqrt{x}$

"inside" = opposite/x shift outside = same/y shift

Example	Vertex
$y = \|x\|$	(0, 0)
$y = \|x + 3\|$	(-3, 0)
$y = \|x\| + 2$	(0, 2)
$y = \|x + 3\| + 2$	(-3, 2)
$y = x^2$	(0, 0)
$y = (x + 3)^2$	(-3, 0)
$y = x^2 + 2$	(0, 2)
$y = (x + 3)^2 + 2$	(-3, 2)
$y = x^3$	(0, 0)
$y = (x + 3)^3$	(-3, 0)
$y = x^2 + 2$	(0, 2)
$y = (x + 3)^3 + 2$	(-3, 2)
$y = \sqrt{x}$	(0, 0)
$y = \sqrt{x + 3}$	(-3, 0)
$y = \sqrt{x} + 2$	(0, 2)
$y = \sqrt{x + 3} + 2$	(-3, 2)

It's easy!

Logarithm Facts

Remember, LOG on the calculator is "Log base 10" (Log_{10})

Fact	Example
$b^x = Y \rightarrow Log_b Y = x$	$2^3 = 8 \rightarrow Log_2 8 = 3$
$LogY = Log_{10} Y$	$Log1000 = Log_{10} 1000$
$Log_x Y = LogY \div LogX$	$Log_2 16 = Log16 \div Log2$
$Log(XY) = Log\ X + Log\ Y$	$Log_3(5 \bullet 3) = Log_3 5 + Log_3 3$
$Log(X/Y) = Log\ X - Log\ Y$	$Log_3(15/3) = Log_3 15 - Log_3 3$
$Log_b Y^x = x Log_b Y$	$Log_2(4^3) = 3 \bullet Log_2 4$
$ln \rightarrow Log_e$	$ln3 = Log_e 3$

Quadratic Word Problems

$$y = -16t^2 + vt + h$$

v = initial upward velocity

h = initial height

Keywords	Meaning	Graphing Calculator Buttons
"How long is it in the air?" "How long until it hits the ground?"	Find the zeros (roots) By: •Factoring, •Graphing Or •Quadratic Formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	-Zero Function- 2nd, TRACE, 2:zero
"How long until it reaches maximum height?"	Find x at the vertex. (axis of symmetry) $x = -\frac{b}{2a}$	-Max Function- 2nd, TRACE, 4:Maximum
"What is its maximum height?"	Find y at the vertex.	-Max Function- 2nd, TRACE, 4:Maximum
"How high is it after x seconds?"	Find the y coordinate (height) at the given x coordinate (time). (Plug the given x back into the equation to find y)	-Value Function- 2nd, TRACE, 1:Value, type in given x value

Common Graphing Calculator Situations

Problem	Solution
I get "ERR:INVALID DIM **1:**Quit" when I try to graph something.	**Y =** ↑ **Plot1** **ENTER** (should be Plot1, not black)
SEE THE GRAPH'S ORIGIN I can't see the origin. The origin is off center. The graph is too small. The graph is too zoomed out. The graph is too zoomed in. Where am I?	**ZOOM** 6:ZStandard
SEE TO THE RIGHT OR LEFT I need to see a part of the graph that is out of the window.	**WINDOW** Change: **Xmin=** **Xmax=** **Ymin=** **Ymax=** to fit what you want to see. **NOTE:** Be sure your Xmax and Ymax are greater than your Xmin and Ymin. You'll get an error if they are not.
Y-INTERCEPT?	TABLE 2nd **GRAPH** Look for where x = 0
FIND THE VERTEX (MINIMUM) What is the lowest point on the graph?	Adjust window to see min point. CALC 2nd **TRACE** 3:minimum Left Bound? Arrow left of the min point **ENTER** Right Bound? Arrow right of the min point **ENTER** Guess? **ENTER**

FIND THE VERTEX (MAXIMUM) What is the highest point on the graph?	Adjust window to see max point. CALC 2nd **TRACE** 4:maximum Left Bound? Arrow left of the max point **ENTER** Right Bound? Arrow right of the max point **ENTER** Guess? **ENTER**
X-INTERCEPTS? ZEROS? Where does the graph cross the x axis? What are the zeros? What are the roots?	Adjust window to see one or both x-intercepts. CALC 2nd **TRACE** 2:zero Left Bound? Arrow left of one x-intercept **ENTER** Right Bound? Arrow right of same x-intercept **ENTER** Guess? **ENTER** Repeat for other x-intercept(s).
SOLUTION? INTERSECTION? Where do 2 lines intersect? What is the solution to this system of equations?	CALC 2nd **TRACE** 5:intersect First curve? Arrow left of intersection **ENTER** Right Bound? Arrow right of intersection **ENTER** Guess? **ENTER**
DOMAIN What is the domain?	Look at the graph, read and record x values from left to right.
RANGE What is the range?	If there is a maximum point: $(-\infty$, maximum point y value$]$ If there is a minimum point: $[$minimum point y value, $\infty)$