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SYLLABUS

ALGEBRA 2 H

Unit 5: Quadratic Equations & Functions

DAY	TOPIC
1	Modeling Data with Quadratic Functions
2	Factoring Quadratic Expressions
3	Solving Quadratic Equations
4	Complex Numbers Simplification, Addition/Subtraction & Multiplication
5	Complex Numbers Division
6	Completing the Square
7	The Quadratic Formula Discriminant
8	**QUIZ**
9	Properties of Parabolas
10	Translating Parabolas
11	Graphs of Quadratic Inequalities and Systems of Quadratic Inequalities
12	Applications of Quadratics (Applications WS)
13	REVIEW

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NOTES

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U5 D1: Modeling Date with Quadratic Functions

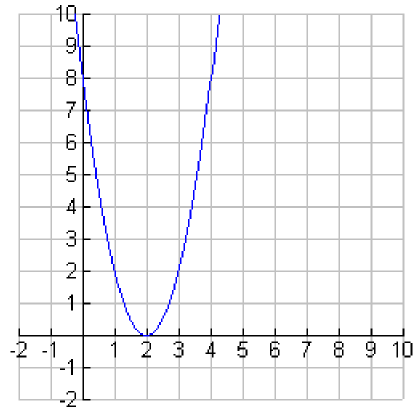
The study of quadratic equations and their graphs plays an important role in many applications. For instance, physicists can model the height of an object over time t with quadratic equations. Economists can model revenue and profit functions with quadratic equations. Using such models to determine important concepts such as maximum height, maximum revenue, or maximum profit, depends on understanding the nature of a parabolic graph.

$$f(x) = ax^2 + bx + c$$

a - ____________________ term

b - ____________________ term

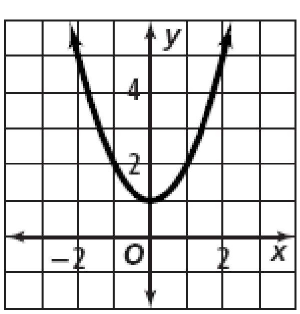
c - ____________________ term



Standard Form: $f(x) = ax^2 + bx + c$		
	Property	**Example:** $y = 2x^2 - 8x + 8$
a positive		
a negative		
Max or Min?		
Vertex		
Axis of Symmetry		
y-intercept		

Identify the vertex and the axis of symmetry of each parabola.

7.



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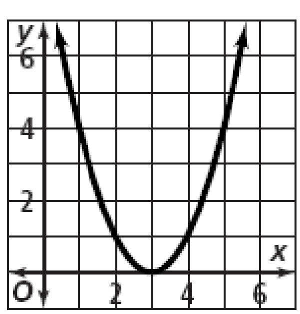

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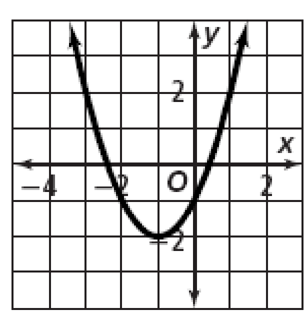


Sometimes we will need to determine if a function is quadratic. Remember, if there is no x^2 term (in other words, $a = 0$), then the function will most likely be linear.

Determine whether each function is linear or quadratic. Identify the quadratic, linear, and constant terms.

10. $y = (x - 2)(x + 4)$

11. $y = 3x(x + 5)$

12. $y = 5x(x - 5) - 5x^2$

13. $f(x) = 7(x - 2) + 5(3x)$

14. $f(x) = 3x^2 - (4x - 8)$

15. $y = 3x(x - 1) - (3x + 7)$

16. $y = 3x^2 - 12$

17. $f(x) = (2x - 3)(x + 2)$

18. $y = 3x - 5$

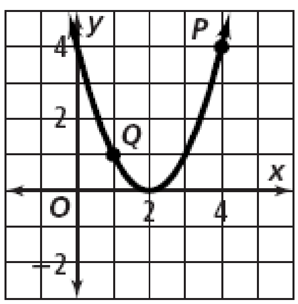
When a function is a quadratic, the graph will look like a _______ (sometimes upside down. When?).

We talked a little about an **axis of symmetry** – what does symmetry mean?!

Use symmetry for the following problems:

For each parabola, identify points corresponding to *P* and *Q*.

19.



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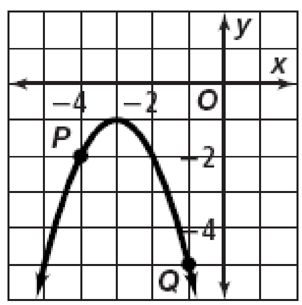

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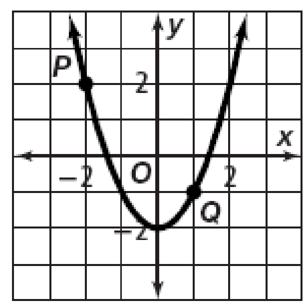

Find a quadratic function to model the values in the table below shown:

x	–1	2	3
$f(x)$	12	3	4

Step 1: Plug all values into ______________________

Step 2: Solve the ________________ of 3 variables. (Favorite solving method?)

Step 3: Write the function →

*Note: If $a = 0$…

Sometimes, modeling the data is a little too complex to do by hand → Graphing Calc!

A toy rocket is shot upward from ground level. The table shows the height of the rocket at different times.

Time (seconds)	0	1	2	3	4
Height (feet)	0	256	480	672	832

a. Find a quadratic model for this data.

b. Use the model to estimate the height of the rocket after 1.5 seconds.

c. What is the maximum height?

d. When does it hit the ground?

The graph of each function contains the given point. Find the value of *c*.

1) $y = -5x^2 + c; (2, -14)$

2) $y = -\frac{3}{4}x^2 + c; \left(3, -\frac{1}{2}\right)$

<u>Closure</u>: Describe the difference between a linear and quadratic function (both algebraically & graphically).

List 3 things that you learned today.

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U5 D2: Factoring Quadratic Expression

2 Terms:

GCF: $14x^2 + 7x$

Difference of 2 Squares: $49x^2 - (x+1)^2$

3 Terms:

Guess & Check: $(x+3)^2 - 12(x+3) + 27$

British Method: $5x^2 + 28x + 32$

Factor the following. You may use the British method, guess and check method, or any other method necessary to factor completely.

1. $4x^2+20x-12$

2. $9x^2-24x$

3. $9x^2+3x-18$

4. $7p^2+21$

5. $4w^2+2w$

6. $(x+1)^2+8(x+1)+7$

7. x^2+6x+8

8. $(x+1)^2+12(x+1)+32$

9. $x^2+14x+40$

10. x^2-6x+8

11. $(x-3)^2-7(x-3)+12$

12. x^2-x-12

13. $x^2 - 14x - 32$

14. $x^2 + 3x - 10$

15. $x^2 + 4x - 5$

16. $(x-3)^2 - y^2$

17. $4x^2 + 7x + 3$

18. $4x^2 - 4x - 15$

19. $2x^2 + 7x - 9$

20. $3x^2 - 16x - 12$

21. $9x^2 - 42x + 49$

22. $4(x-2)^2 + 12(x-2) + 9$

23. $64x^2 - 16x + 1$

24. $25x^2 + 90x + 81$

25. $x^2 - 64$

26. $(4x^2 - 49)$

27. $36(x+5)^2 - 100$

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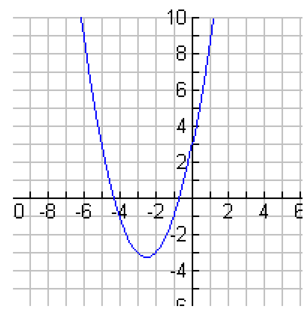
ALGEBRA 2

U5 D3: Solving Quadratic Equations

Objective: Be able to solve quadratic equations using any one of three methods.

Factoring	Taking Square Roots	Graphing
$x^2 + 18 = 9x$	$9x^2 = 25$	$x^2 + 5x + 3 = 0$ 

Additional Notes:

Partnered Unfair Game!

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U5 D4: Complex Numbers – Intro & Operations (not Division)

1. On your home screen, type $\sqrt{-9}$. What answer does the calculator give you?

2. **Go to** MODE and change your calculator from REAL to "$a+bi$" form (3rd row from the bottom)

3. On your home screen, type $\sqrt{-9}$ again. This time what answer does it give you?

4. Use the calculator to simplify each of the following:

   a. $\sqrt{-25}$ b. $\sqrt{-9}\cdot\sqrt{-4}$ c. $-\sqrt{-100}$

   Now look for the *i* on your calculator (it's the 2nd "." near 0), then calculate each of the following:

   a. i^2 b. $(2+i)(5-3i)$ c. $(4i)(1+2i)$

5. From your investigation, what does "*i*" represent? What kind of number is "*i*"?

6. What is the meaning of $a+bi$?

Imaginary numbers are not "invisible" numbers, or "made-up" numbers. They are numbers that arise naturally from trying to solve equations such as $x^2+1=0$

Imaginary numbers "*i*": the number whose square is -1.

$i =$	$i^2 =$

Simplify the following:

1. $\sqrt{-8}$ 2. $\sqrt{-2}$ 3. $\sqrt{-12}$

Complex number: imaginary numbers and real numbers together. *a* and *b* are **real** numbers, including 0.

$$a + bi$$

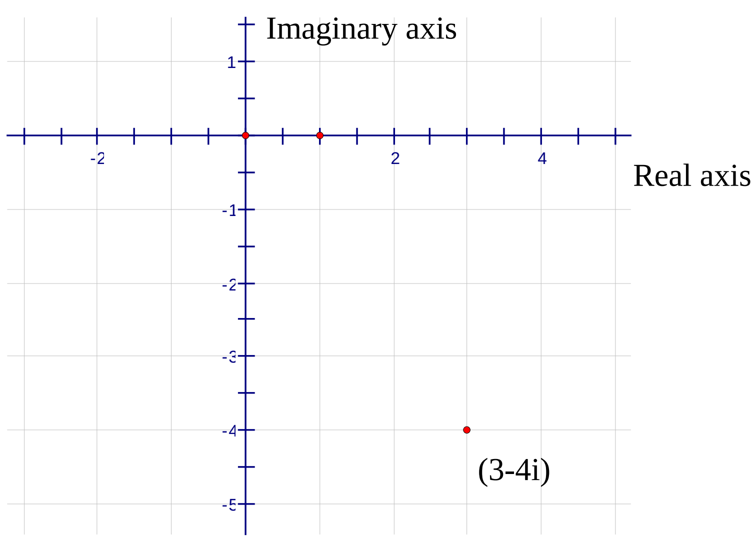
REAL PART | IMAGINARY PART

Simplify

4. $\sqrt{-9}+6$ in the form $a+bi$

5. Write the complex number $\sqrt{-18}+7$ in the form $a+bi$

You can use the **complex number plane** to represent a complex number geometrically. Locate the real part of the number on the horizontal axis and the imaginary part on the vertical axis. You graph $3-4i$ the same way you would graph (3,-4) on the coordinate plane.



6. On the graph above, plot the points $-2-2i$ and $4i+1$

★**Absolute value of a complex number** is its distance from the origin on the complex number plane. To find the absolute value, use the Pythagorean Theorem. $|a+bi|=\sqrt{a^2+b^2}$

Find the absolute value of the following

7. $|5i|$

8. $|3-4i|$

9. |10+24i|

Additive Inverse of Complex Numbers

Find the additive inverse of the following:

10. $-2+5i$

11. $-5i$

12. $4-3i$

13. $a+bi$

Adding/Subtracting Complex Numbers

14. $(5+7i)+(-2+6i)$

15. $(8+3i)-(2+4i)$

16. $(4-6i)+3i$

Multiplying Complex Numbers

17. Find $(5i)(-4i)$

18. $(2+3i)(-3+6i)$

19. $(12i)(7i)$

20. $(6-5i)(4-3i)$

21. $(4-9i)+(4+3i)$

22. $(2i-3i^3)^2$

Finding Complex Solutions

22. Solve $4x^2+100=0$

23. $3x^2+48=0$

24. $-5x^2-150=0$

25. $8x^2+2=0$

Closure: What are two complex numbers that have a square of -1?

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U5 D5: Complex Numbers & Complex Division

Warmup: Fill in the table…

i	i^2	i^3	i^4	i^5	i^6	i^7	i^8	i^9	i^{10}	i^{11}	i^{12}	i^{13}	i^{14}	i^{15}

Generalize this "cyclic" concept to find the following:

i^{80} = ____________ , i^{133} = ______________, i^{1044} = ____________________

$i =$

$i^2 =$

$i^3 =$

$i^4 =$

Divide the exponent by 4 and find the remainder

Match the remainder the chart on the left.

Use that value as your answer.

The conjugate of a+bi is a-bi (note it is NOT the inverse), and the conjugate of a-bi is a+bi

Examples

1. 3+4i; the conjugate is 3-4i
2. -4-7i; the conjugate is -4+7i
3. 5i; the conjugate is -5i since the conjugate of 0+5i is 0-5i
4. 6; the conjugate of 6 is 6 since 6-0i is the conjugate of 6+0i

Complex division

To divide complex numbers, multiply the numerator and demoninator by the conjugate of the denominator.

5. $\frac{-5+9i}{1-i}$

6. $\frac{2+3i}{3-5i}$

7. $\frac{6+2i}{1-3i}$

8. $\frac{2+3i}{-1+4i}$

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CLASSWORK

ALGEBRA 2 H - AB

Worksheet U5 D5

1. $\frac{(3-2i)}{(4+3i)}$
2. $\frac{6-2i}{3i}$
3. $\frac{(5-7i)}{(6+2i)}$
4. $\frac{(4i-4)}{5i}$
5. $\frac{(4+i)}{(4-3i)}$
6. $\frac{3-8i}{5-4i}$
7. $\frac{(5+7i)}{\sqrt{-4}}$
8. $(3i+\sqrt{-9})(4-2i)$
9. $\frac{6+5i}{6-5i}$
10. $\frac{7-2i}{2+7i}$
11. $\frac{(3-2\sqrt{-25})}{(1+\sqrt{-16})}$
12. $i^4 \bullet (3i^5-2i)$
13. $\frac{3-9i}{i^7}$

REALLY, AS COMPLEX AS IT ALL MAY SEEM, A LITTLE RADICAL THINKING CAN TAKE YOU A LONG WAY! IMAGINE THE POSSIBILITIES!

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U5 D6: Completing the Square

Another solving method for quadratics is **completing the square**. The goal is to get the left side of your equation to be in the form of $(x+\#)^2$ so that you can take the ______________ __________ of both sides.

Quick example: $x^2+10x+25=36$

Expressions like $x^2+10x+25$ are called ________________ ________________ ________________ because they factor into $(x+\#)^2$ instead of two **different** binomials $(x+\#_1)(x+\#_2)$.

Unfortunately, sometimes our expression on the left is not a perfect square.

Solution: ______________________ the square to make it perfect!

Examples:

1) x^2+6x+ ______

★ The value that completes the square is always ________________

2) x^2-7x+ ______

3) x^2-2x+ ______

Now let's apply this process to solving an equation.

Example #1: $x^2-x-5=0$

STEP 1: Get the equation in the form _________________________ (move the #'s to the right).

STEP 2: Find the amount to be added by taking _________________.

STEP 3: Add that amount to **both sides**. x^2-x+ _____ $=5+$ _____

STEP 4: Factor the left side and simplify the right →

STEP 5: Take the square root of both sides.

Example #2: $x^2+12x+4=0$

Notice in the previous examples, $a = 1$. If it does not, we have to ________________ it!

Example #3: $4x^2 + 10x = -7$

Example #4: $\frac{1}{2}x^2 + 4x = 2$

Example #3: The equation $h(t) = -t^2 + 3t + 4$ models the height, ***h* in feet**, of a ball thrown after ***t* seconds**. Complete the square to find how many second it will take for the ball to hit the ground.

Classwork Examples:

1. $x^2 + 6x + 41 = 0$

2. $2x^2 = 2x + 4$

3. $x^2 = -3x - 3$

4. The equation $h(t) = -t^2 + 2t + 3$ models the height, ***h* in feet**, of a ball thrown after ***t* seconds**. Complete the square to find how many second it will take for the ball to hit the ground.

5. $x^2 + 11x = 0$

6. $x^2 = 5x + 14$

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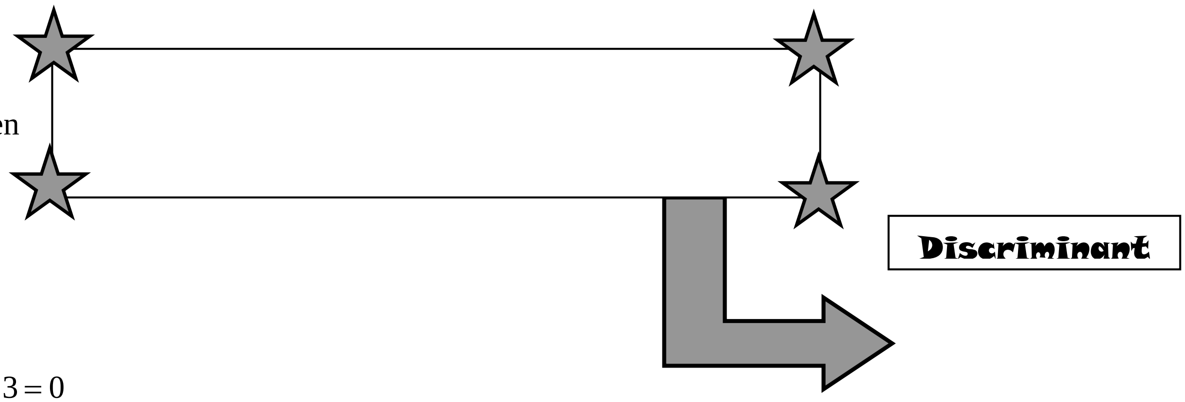
U5 D7: The Quadratic Formula & Discriminant

When given an quadratic equation, we have learned several ways to solve…

Factor (if applicable), _________________ the square, taking square roots, and _______________.

Today we will (re?)learn another method: Everyone's favorite, the _______________________ formula!!!!

If $ax^2+bx+c=0$, then



Example 1: $x^2-4x+3=0$

2) $x^2-6x+11=0$

3) $2x^2-1=5x$

Directions: Just find the discriminate for each equation

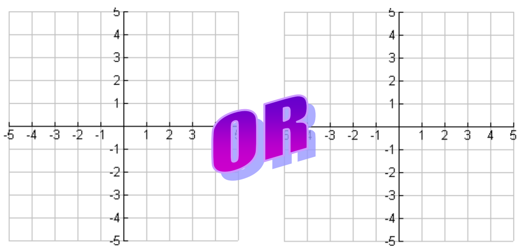
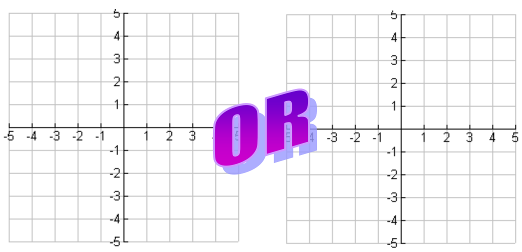
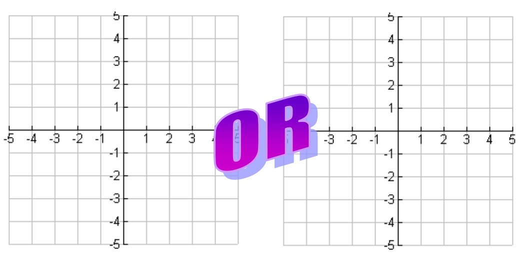
4) $x^2+4x+5=0$

5) $x^2-4x-5=0$

6) $4x^2+20x+25=0$

The determinant can tell us about the graph and the number of solutions, and even the solving methods…

On the first day of the unit, we looked how the values of a quadratic function effect the graph…

Look of Graph	Discriminant	Solution Types	Solving Method
			
			
			

<u>WoRdIE</u>: The function $h(t) = -16t^2 + 12t$ models the height of a bowling ball thrown into the air.

Use the quadratic formula to find the time it will take for the ball to hit the ground.

Then, use your calculator to find the time it will take for the ball to hit the ground (check).

Finally, use your calculator to find the time of the maximum height, and what that max height is…

More classwork examples on the next page…

Evaluate the discriminant of each equation. Tell how many solutions each equation has and whether the solutions are real or imaginary.

1. $y = x^2 + 10x - 25$	**2.** $y = x^2 + 10x + 10$	**3.** $y = 9x^2 - 24x$
4. $y = 4x^2 - 4x + 1$	**5.** $y = 4x^2 - 5x + 1$	**6.** $y = 4x^2 - 3x + 1$
7. $y = x^2 + 3x + 4$	**8.** $y = x^2 + 7x - 3$	**9.** $y = -2x^2 + 3x - 5$
10. $y = x^2 - 5x + 4$	**11.** $y = x^2 + 12x + 36$	**12.** $y = x^2 + 2x + 3$
13. $y = 2x^2 - 13x - 7$	**14.** $y = -5x^2 + 6x - 4$	**15.** $y = -4x^2 - 4x - 1$

Solve each equation using the Quadratic Formula.

16. $x^2 + 6x + 9 = 0$	**17.** $x^2 - 15x + 56 = 0$	**18.** $3x^2 - 5x + 2 = 0$
19. $2x^2 + 3x + 5 = 0$	**20.** $10x^2 - 23x + 12 = 0$	**21.** $4x^2 + x - 5 = 0$
22. $x^2 + 8x + 15 = 0$	**23.** $3x^2 + 2x + 1 = 0$	**24.** $4x^2 + x + 5 = 0$
25. $x^2 - 4x - 12 = 0$	**26.** $x^2 = 3x + 2$	**27.** $2x^2 - 5x + 2 = 0$
28. $x^2 + 6x - 4 = 0$	**29.** $x^2 = 2x - 5$	**30.** $3x^2 + 7 = -6x$
31. $2x^2 + 6x + 3 = 0$	**32.** $x^2 = -18x - 80$	**33.** $x^2 + 9x - 13 = 0$
34. $x^2 - 8x + 25 = 0$	**35.** $4x^2 + 13x = 12$	**36.** $3x^2 - 5x = -12$
37. $3x^2 + 4x + 5 = 0$	**38.** $2x^2 = 3x - 7$	**39.** $5x^2 + 2x + 1 = 0$
40. $5x^2 + x + 3 = 0$	**41.** $5x^2 + x = 3$	**42.** $5x^2 - 2x + 7 = 0$
43. $x^2 - 2x + 3 = 0$	**44.** $-2x^2 + 3x = 24$	**45.** $4x^2 = 5x - 6$
46. $x^2 + 6x + 5 = 0$	**47.** $x^2 - 6x = -8$	**48.** $x^2 - 6x = -6$

Solve.

49. A model of the daily profits p of a gas station based on the price per gallon g is $p = -15{,}000g^2 + 34{,}500g - 16{,}800$. Use the discriminant to find whether the station can profit \$4000 per day. Explain.

Solve each equation using the Quadratic Formula. Find the exact solutions. Then approximate any radical solutions. Round to the nearest hundredth.

50. $x^2 - 2x - 3 = 0$	**51.** $x^2 + 5x + 4 = 0$	**52.** $x^2 - 2x - 8 = 0$
53. $7x^2 - 12x + 3 = 0$	**54.** $5x^2 + 5x - 1 = 0$	**55.** $4x^2 + 5x + 1 = 0$
56. $6x^2 + 5x - 4 = 0$	**57.** $x^2 + x = 6$	**58.** $x^2 - 13x = 48$
59. $2x^2 + 5x = 0$	**60.** $x^2 + 3x - 3 = 0$	**61.** $x^2 - 4x + 1 = 0$
62. $9x^2 - 6x - 7 = 0$	**63.** $x^2 - 35 = 2x$	**64.** $x^2 + 7x + 10 = 0$

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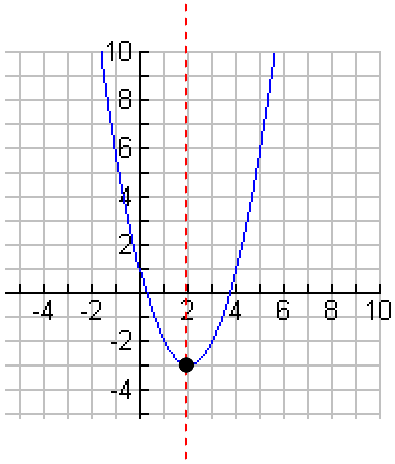
U5 D9: Properties of Parabolas



2 Forms: $y=(x-2)^2-3$ $y=x^2-4x+1$

Quadratics!!!	General Equation	Vertex is @	Axis of Symmetry	Intercepts
Standard Form				
Vertex Form				

Today we will focus more on standard form, and tomorrow we will cover vertex form.

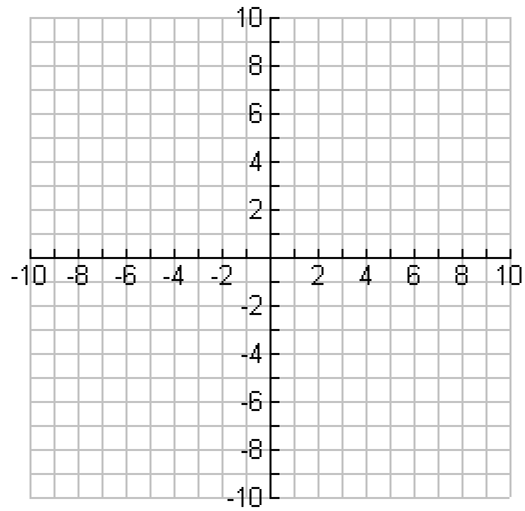
Directions: For each equation, find **(a)** the vertex, **(b)** the axis of symmetry, and **(c)** the *y*-intercept.

1. $y=x^2-6x+2$

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

3. $y=-x^2+5$

Now we are going to graph the parabolas of the quadratic functions.



1. $y = 2x^2 + 4x - 3$

STEP 1: Find the vertex. V: ___________

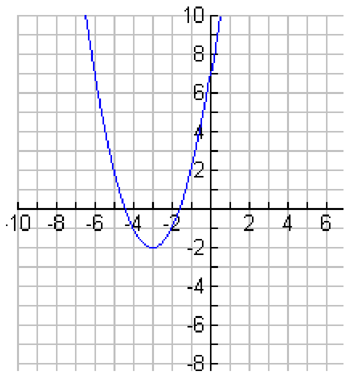
STEP 2: Find the axis of symmetry AoS: _____________

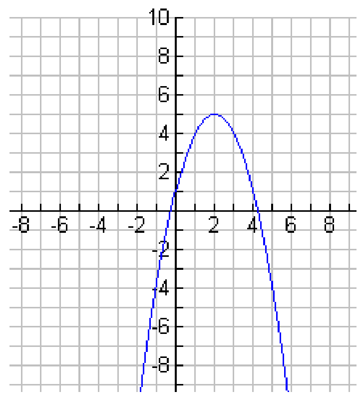
STEP 3: Find the *y*-intercept. _______ & its "match" ________

STEP 4: Find one more point by choosing a value for *x*.

Additional Information: Min or Max of ________ @ __________ *x*-intercepts

Minimums & Maximums





Application: Suppose you are tossing a baseball up to a friend on a third-story balcony. After t seconds the height of the apple in feet is given by the function $h(t) = -16t^2 + 38.4t + .096$. Your friend catches the ball just as it reaches its highest point. How long does the ball take to reach your friend, and at what height does he catch it?!

Converting Forms:

Vertex → Standard

$y = 2(x-3)^2 + 5$

Standard → Vertex

$y = x^2 + 6x - 2$

(You must complete the square!!!!!!!!!!!!!!!!)

Closure: What are the general equations for standard and vertex form of a quadratic?

List how you can find important information from each (such as vertex, axis of symmetry, intercepts, etc…)

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U5 D10: Translating Parabolas

1. Review the general equation for vertex form and standard form of a quadratic…

2. Identify the vertex and the y-intercept from the equations below…

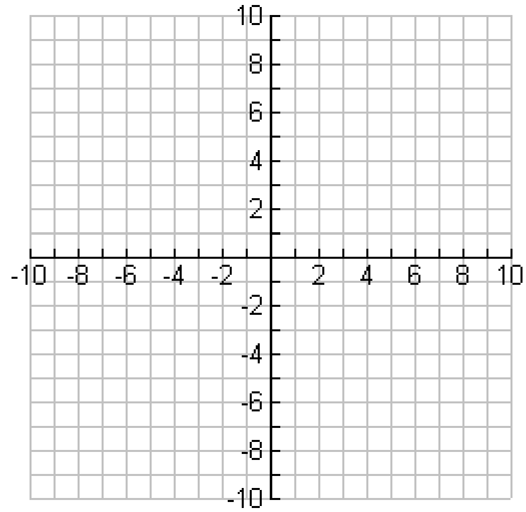
a) $y=(x-4)^2+3$

b) $y=2(x+2)^2-5$

c) $y=x^2+4x-1$

3. We will graph vertex form in a similar way that we did standard from, except now the vertex is easy!

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



STEP 1: Find the vertex. V: ___________

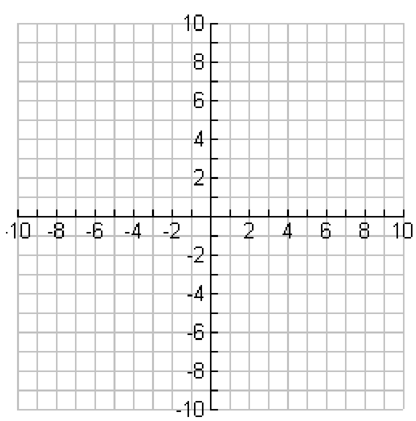
STEP 2: Find the axis of symmetry AoS: _____________

STEP 3: Find another point. _______ & its "match" ________

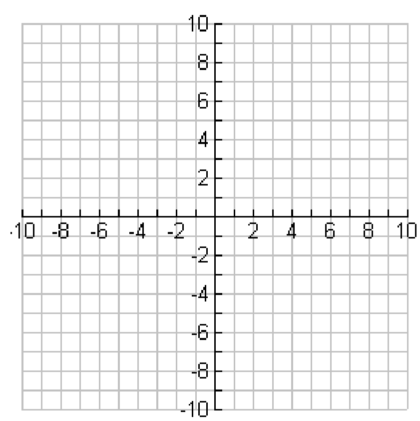
STEP 4: Repeat step 3

4. Graph each of the following:

a) $y=2(x+2)^2-3$



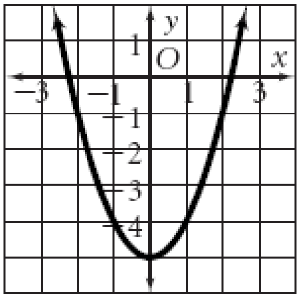
b) $y=(x+3)^2-4$



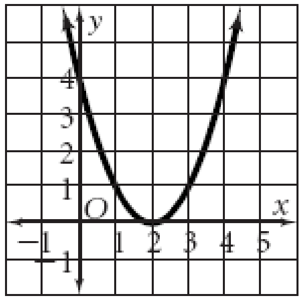
5. Sometimes we will need to write the equation of the parabola…

Write the equation of the parabola in vertex form.

1.



2.



Step 1: Locate the Vertex

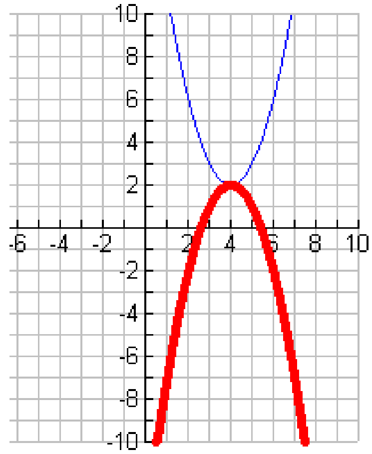
Step 2: Locate another point

Step 3: Plug in to $y = a(x-h)^2 + k$
and solve for *a*.

3. vertex is $(3,6)$ and y-intercept is 2

4. vertex is $(-3,6)$ and point is $(1,-2)$

Closure: the equation of one of the parabolas in the graph at the right is $y = (x-4)^2 + 2$. Write the equation of the other parabola. Then, if you have time, write both equations in standard form, and identify the *y*-intercepts.



NAME ________________

Date __________ Period__________

NOTES
ALGEBRA 2

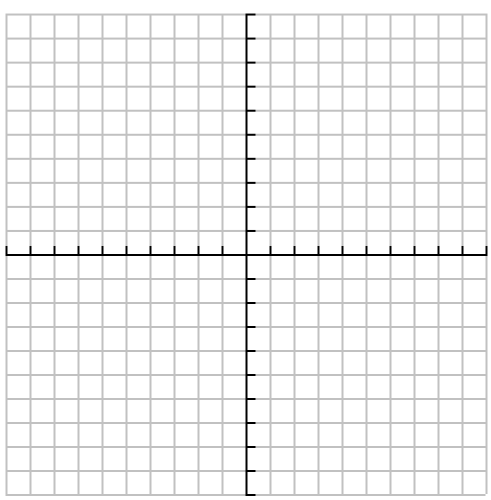
U5 D11: Graphs of Quadratic Inequalities & Systems

Warm-up: For each inequality, identify "above/below" and "solid/dashed"

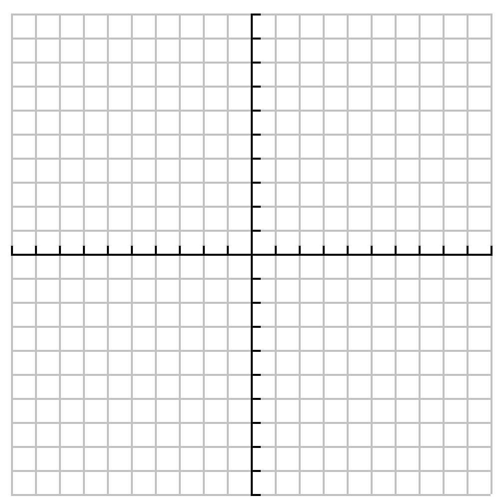
$<$ ______________, $>$ ______________, $\geq$ ______________, $\leq$ ______________

Graph the following:

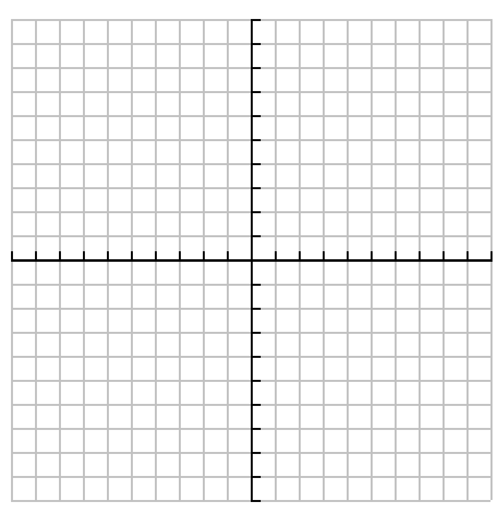
1. $y > x^2 - 2x - 3$



2. $y \geq x^2$
$y \leq x^2 + 3$



3. $y > x^2 - 6x + 9$
$y < -x^2 + 6x - 3$



NAME ____________________

Date __________ Period__________

CLASSWORK
ALGEBRA 2

U5 D12: Applications of Quadratics Worksheet

1. The path of a baseball after it has been hit is modeled by the function $h = -0.0032d^2 + d + 3$, where h is the height in feet of the baseball and d is the distance in feet the baseball is from home plate. Graph the function on your calculator to answer the following questions.
   a. What is the maximum height reached by the ball?

   b. How far is the ball from home plate when it reaches the maximum height?

   c. If the ball falls on the ground instead of being caught, how far from home plate did it land?

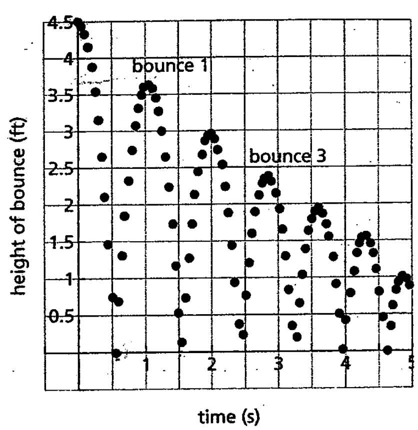
2. The area of a rectangular field is 875 m^2. Two adjacent sides of the field are fenced with wood costing $5 per meter. The remaining two sides are fenced with steel costing $10 per meter. The total cost of the fencing is $900. What are the dimensions of the field?

3. A motion detector collected data about a bouncing ball. The graph at the right shows a plot of the data.
   a. About how long was the ball in the air for the first bounce?

   b. Approximately how high did the ball go on the first bounce?

   c. Write the equation of the parabola for the first bounce.

   d. Write the equation of the parabola for the third bounce.



   e. Write all of the vertices for the initial drop, bounce 1, bounce 2... up to bounce 6.

   f. Plot these vertices in your stat plot and draw a scatterplot. Do they appear to be linear? If not, what type of graph do they appear to create?

   g. Find the regression equation that goes along with the model you believe to be time vs. max height of the ball.

NAME ____________________

Date __________ Period__________

REVIEW! ALGEBRA 2

U5 D13: Review for Unit 5 Test

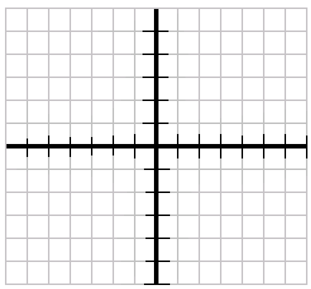
Problems 1 – 7 should all be done by hand. The calculator can be used for 8 - 10.
Answers should be left in simplest radical form.

1. Write the equation of the parabola in standard form through the points (2, 7), (-1, 10) and (0, 5).

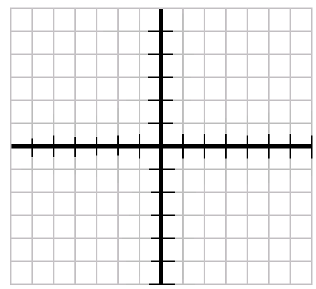
2. Write the equation of the parabola with a vertex of (3, 1), through the point (-1, -15).

3. Write each of the following equations in vertex form by completing the square (if not done already). Sketch the graph by determining the vertex, the line of symmetry, the y-intercept, and the x-intercept(s) if they exist.

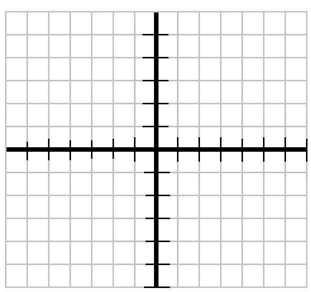
a. $y = x^2 + 10x - 20$



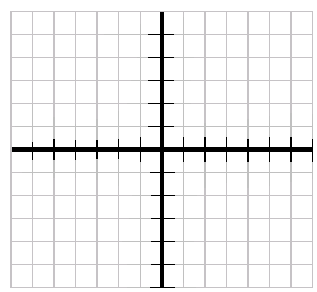
b. $y = -x^2 - 1$



c. $y = -2x^2 + 8x + 5$



d. $y = \frac{1}{4}(x+2)^2$



4. Solve each quadratic equation. Use a **variety** of methods.

a. $x^2 + 4x = 21$ b. $x^2 - 5x - 5 = 0$ c. $10x - 6 = 5x^2$

d. $2x^2 + x = 10$ e. $3x^2 - 3 + 4x = 0$ f. $x^2 + 2 = -2x$

5. Simplify each expression into a+bi form. Show all work.

a. (8+4i)(1-3i)

b. $2i^4(3-6i^3)$

c. i^{111} (simplify- hint: find remainder)

d. $\frac{4-i}{2+5i}$

e. $3\sqrt{-25}(1+\sqrt{-8})$

f. $\frac{3+7i}{2i^5}$

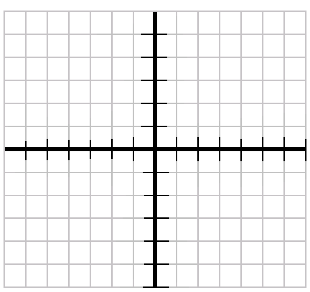
6. Evaluate the discriminant and determine the type and number of solutions.

a. $x^2+3x+2=0$

b. $-8x^2+8x-2=0$

7. Write an equation in which the discriminant is equal to -9.
What type of solutions does your equation have?

8. Graph the system of quadratic inequalities. Shade the region and find the intersection points.



$y \geq 2x^2 - 8$

$y \geq (x-4)^2$

9. The equation $y = 0.5x - 0.01x^2$ represents the parabolic flight of a certain cannonball shot at an angle of 26°, where y is the height of the cannonball and x is the vertical distance traveled in meters. Try this WINDOW [-5, 60, 5, -1, 10, 1], this follows the order of xmin, xmax etc.

a. What is the maximum height of the cannonball? How do you know? Explain your method.

b. What is the total horizontal distance traveled by the cannonball? How do you know? Explain your method.

10. A rectangular backyard will be fenced in on 3 sides. If there is 200ft of fencing,

a. Determine the dimensions of the fence for the maximum area.

b. Determine the maximum area.