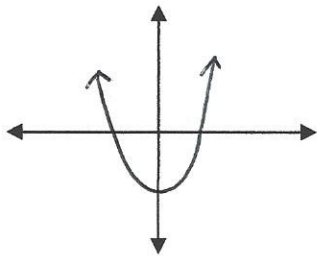
Algebra RH

Essential Question: What do the graphs of quadratic functions look like?

Do Now: Using your graphing calculator, go to $y =$ and graph the equation $y = x^2 + x - 3$.
Draw a sketch of what your graph looks like.



Graphing Quadratic Functions

- The equation must be in **standard form**, $y = ax^2 + bx + c$
- Find the x-coordinate of the **vertex** (turning point) using the formula, $x = \frac{-b}{2a}$
- Create a **table of values** using three x-values smaller than the vertex, and three x-values larger than the vertex.
- **Graph** the points from the table of values and **connect** them with a smooth **curve**.
- **Label** the parabola using the original equation.

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1. Graph $y = x^2 - 2x + 5$

$a = 1$
$b = -2$
$c = 5$

$x = \frac{-b}{2a}$

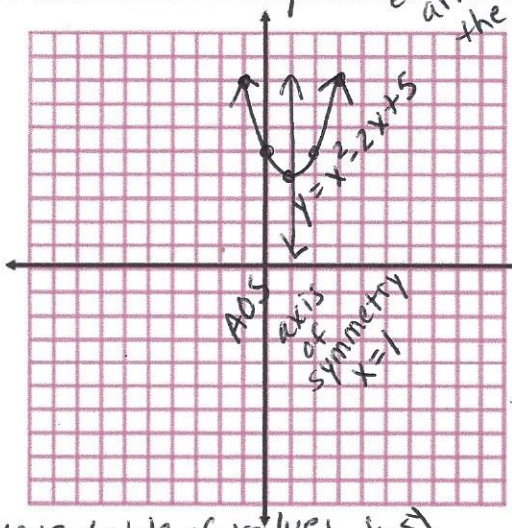
$x = \frac{-(-2)}{2(1)}$

$x = 1$

vertex (turning point)

	x	y
*	-2	13
	-1	8
	0	5
	1	4
	2	5
	3	8
*	4	13

do not extend your arrows past the last point on a curve



* unless you are given a restricted domain, you don't have to graph every point in your table of values *

2. Graph $y = -2x^2 + 8x + 1$

$a = -2$
$b = 8$
$c = 1$

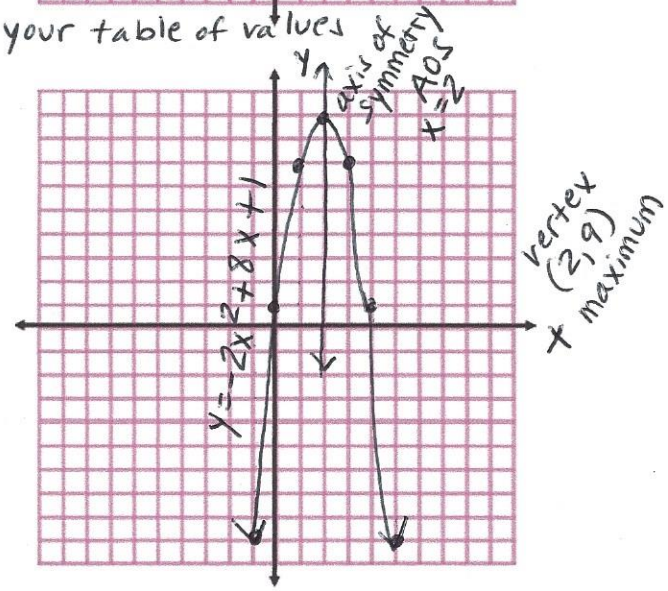
$x = \frac{-b}{2a}$

$x = \frac{-(8)}{2(-2)}$

$x = 2$

middle value
vertex (turning point)

x	y
-1	-9
0	1
1	7
2	9
3	7
4	1
5	-9



- The parabola opens **up** when the *a* value is positive and **down** when the *a* value is negative.

- If the parabola opens *up*, the vertex is called the minimum (lowest point). If the parabola opens *down*, the vertex is the maximum (highest point).

- The *vertical line* that divides the parabola into two equal halves, through the vertex, is called the axis of symmetry.

⇨ Go back to the first two graphs and label the axis of symmetry and vertex, and state if the vertex is a minimum or maximum.

Algebra RH **HW #_____**

For the following quadratic equations:

1) **Create a table of values.**
2) **Graph the parabola on graph paper. (Graph each parabola separately.)**
3) **Label the vertex and determine if it is a minimum or maximum point.**
4) **Graph and label the axis of symmetry for each graph.**

Examples:

1. $y = x^2 - 6x + 8$

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

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

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

5. $y = \frac{1}{2}x^2 - 4x + 6$

6. $y = 3x^2 + 6x - 10$

1) $y = x^2 - 6x + 8$

x	y
0	8
1	3
2	0
3	-1
4	0
5	3
6	8

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

x	y
-3	-5
-2	0
-1	3
0	4
1	3
2	0
3	-5

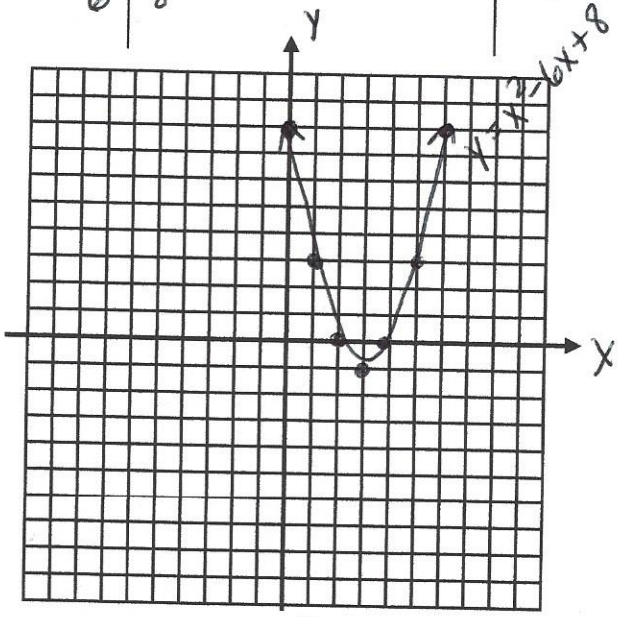
3) $y = -x^2 - 4x - 4$

x	y
-5	-9
-4	-4
-3	-1
-2	0
-1	-1
0	-4
1	-9

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

x	y
-2	-5
-1	1
0	3
1	1
2	-5

(1)



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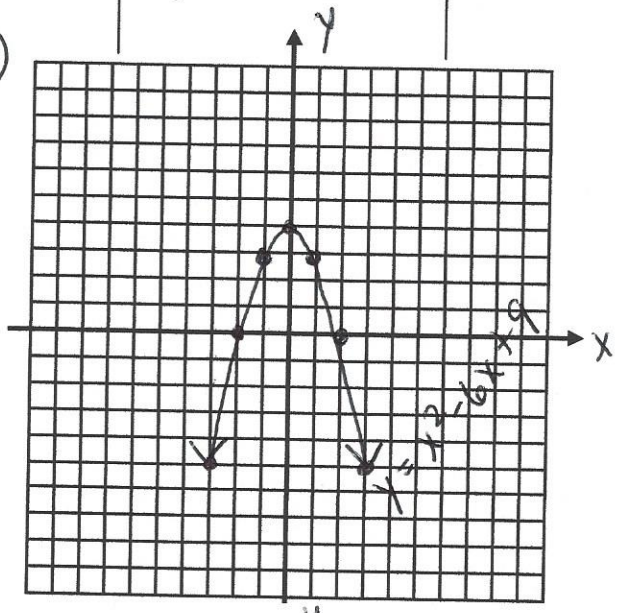

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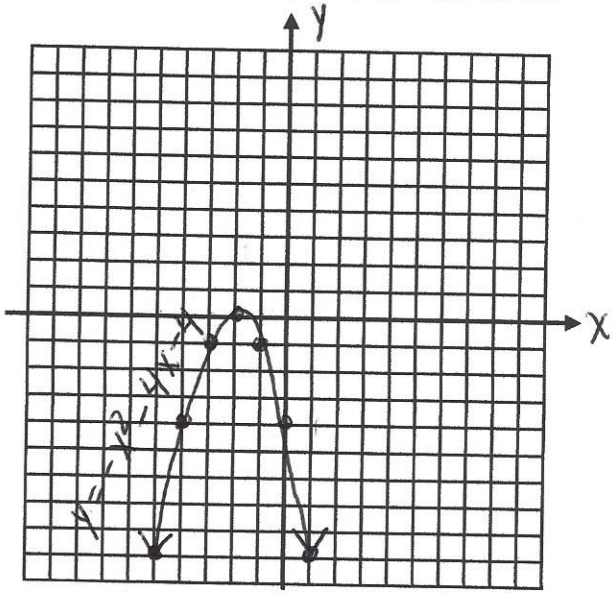

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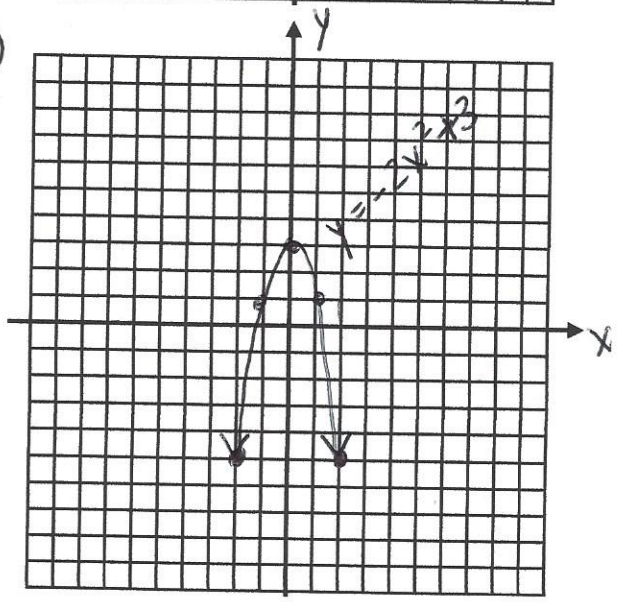


5) $y = \frac{1}{2}x^2 - 4x + 6$

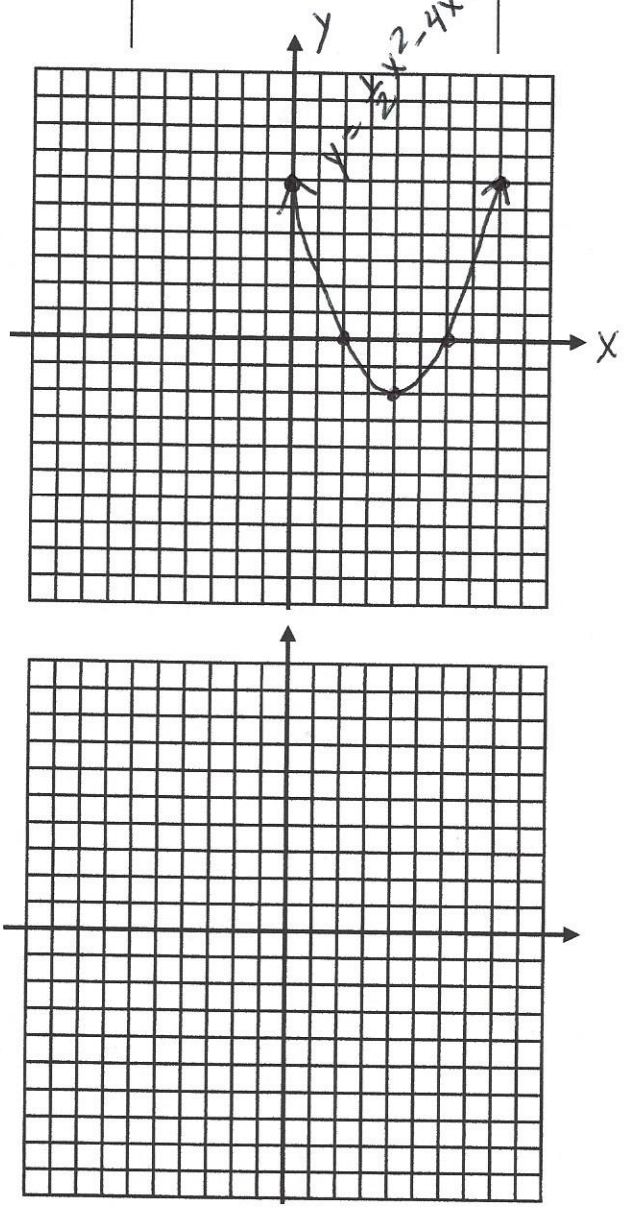
0	6
2	0
4	−2
6	0
8	6

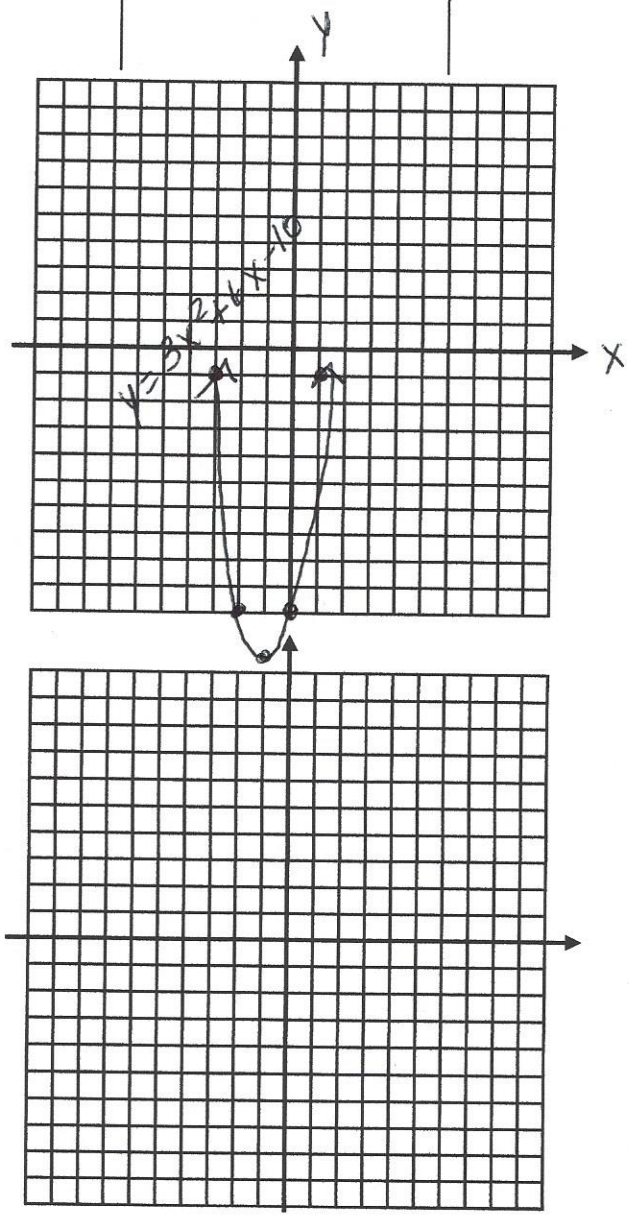
use multiples of the denominator →

6) $y = 3x^2 + 6x - 10$

−3	−1
−2	−10
−1	−13
0	−10
1	−1

(5)





Algebra RH

Essential Question: What are the roots of a quadratic function?

Do Now: Using a table of values, graph the following four quadratic functions.

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

x	y
-4	5
-3	0
-2	-3
vertex: -1	-4
0	-3
1	0
2	5

b. $y = x^2 - 6x + 9$

x	y
0	9
1	4
2	1
vertex: 3	0
4	1
5	4
6	9

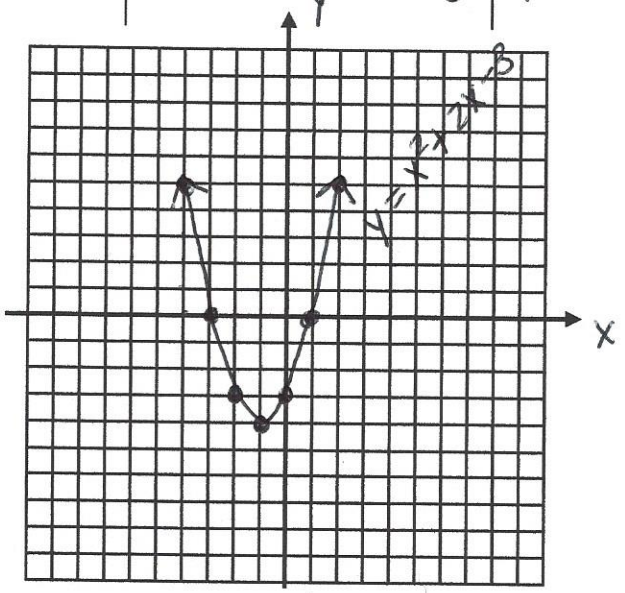
c. $y = x^2 + 3$

x	y
-2	7
-1	4
0	3
1	4
2	7

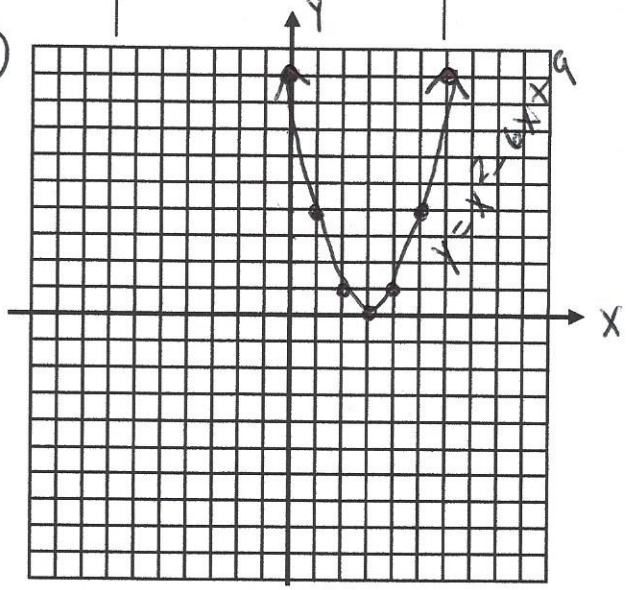
d. $y = x^2 + 4x - 2$

x	y
-5	3
-4	-2
-3	-5
-2	-6
-1	-5
0	-2
1	3

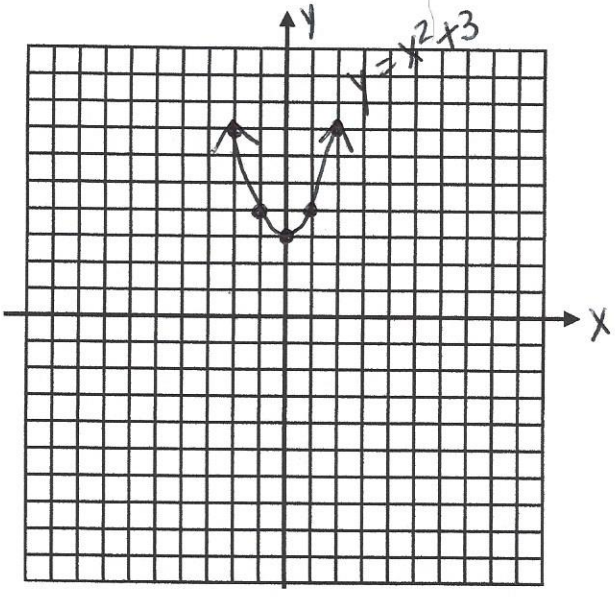
(a)



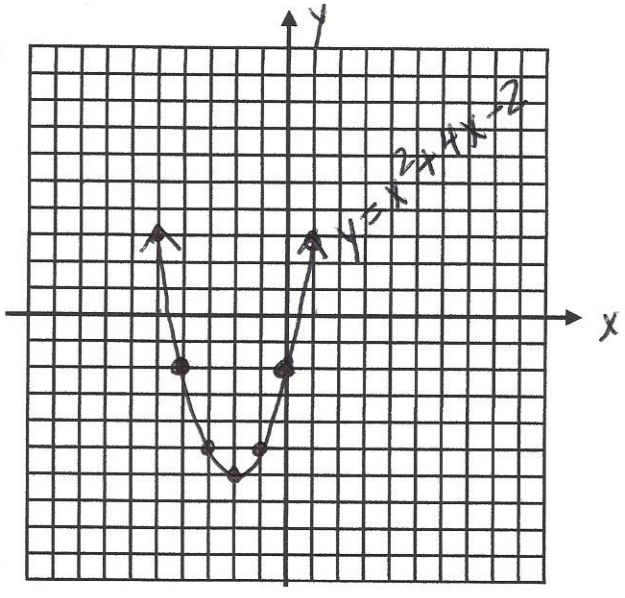
(b)



(c)



(d)



Complete the following table.

roots, solutions, zeros

Quadratic Function	x-intercept(s)
$y = x^2 + 2x - 3$	-3, 1
$y = x^2 - 6x + 9$	3
$y = x^2 + 3$	none
$y = x^2 + 4x - 2$	between -4 and -5, between 0 and 1

How do we determine *x*-intercept(s)

Graphically?	**Algebraically?**
where the graph crosses the x-axis	set equation = to zero solve by factoring, square "rooting," or by using the quadratic formula

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

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

$0 = (x+3)(x-1)$

$x+3=0$ | $x-1=0$

$x=-3$ | $x=1$

$\{-3, 1\}$

$y = x^2 - 6x + 9$

$0 = x^2 - 6x + 9$

$0 = (x-3)(x-3)$

$x-3=0$ | $x-3=0$

$x=3$ | $x=3$

$\{3\}$

$y = x^2 + 3$

$0 = x^2 + 3$

$x^2 = -3$

$\sqrt{x^2} = \pm\sqrt{-3}$

$x = \pm i\sqrt{3}$

$\{i\sqrt{3}, -i\sqrt{3}\}$

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

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

$a = 1$

$b = 4$

$c = -2$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \frac{-4 \pm \sqrt{(4)^2-4(1)(-2)}}{2(1)}$

$x = \frac{-4 \pm \sqrt{24}}{2}$

$x = \frac{-4 \pm \sqrt{4}\sqrt{6}}{2}$

$x = \frac{-4 \pm 2\sqrt{6}}{2} = -2 \pm \sqrt{6}$

Take Away: The *x*-intercepts of a quadratic function are also known as the

roots **and** solutions **of the related equation.**

(or zeros)

Algebra RH HW #_____

For each quadratic function below:

- **Create a table of values and graph on graph paper.**
- **Draw and label the axis of symmetry.**
- **Identify the "roots" of the function** ***(also known as the x-intercepts of the graph).***
  If the roots are not integers, use the calculator (2nd CALC → 2:zero) to find them. Round all roots to the nearest tenth when necessary.

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

2) $y = x^2 + 2x + 1$

3) $y = x^2 + 4x + 1$

Without graphing the quadratic function, determine the x-intercepts (roots) of the graph.

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

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

Without graphing, use the quadratic formula to determine the x-intercepts (roots) of the graph.

6) $y = x^2 - 4x + 7$