Algebra
9.3 & 9.4 Notes
Solving & Graphing Quadratic Functions

Standards:
A1.8.1 Graph quadratic, cubic, and radical equations.
A1.8.7 Use quadratic equations to solve word problems.

9.3 Vocabulary

1. A **quadratic function** is a function that can be written in the **standard form**:

$$y = ax^2 + bx + c, \text{ where } a \neq 0$$

2. Every quadratic function has a U-shaped graph called a _____.

3. If the leading coefficient *a* is positive, the parabola _____.

4. If the leading coefficient *a* is negative, the parabola _____.

5. The _____ is the lowest point of a parabola that opens up and the highest point of a parabola that opens down.

6. The line passing through the vertex that divides the parabola into two symmetric parts is called the _____.

7. Solutions of quadratic functions can also be called the _____, _____, or _____.

To find the Vertex and Axis of Symmetry

1. Put the quadratic function in standard form: $y = ax^2 + bx + c$
2. Identify the numeric values of *a*, *b*, and *c*.
3. The vertex has an *x*-coordinate of $x = \frac{-b}{2a}$. Plug in the values for *a* and *b*.
4. Substitute whatever you get for *x* in step 3 into the quadratic function to find the *y*-coordinate of the vertex.
5. The axis of symmetry is the vertical line $x = \frac{-b}{2a}$

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Example 1 – Find the vertex and Axis of Symmetry for these quadratic functions:

a.) $y = -2x^2 + 4x - 9$

$a =$ ___ $b =$ ___ $c =$ ___

Vertex: _____

Axis of Symmetry: _____

b.) $y = x^2 - 10$

$a =$ ___ $b =$ ___ $c =$ ___

Vertex: _____

Axis of Symmetry: _____

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

$a =$ ___ $b =$ ___ $c =$ ___

Vertex: _____

Axis of Symmetry: _____

d.) $y = -2x^2 + 8x - 8$

$a =$ ___ $b =$ ___ $c =$ ___

Vertex: _____

Axis of Symmetry: _____

Steps for Graphing a Quadratic Function

1. Follow the above steps to find the vertex and axis of symmetry.
2. Plot the vertex and the axis of symmetry on a coordinate plane.
3. Make a table of values, using *x*-values to the left and right of the vertex.
4. Plot the points and connect them with a smooth curve to form a parabola.

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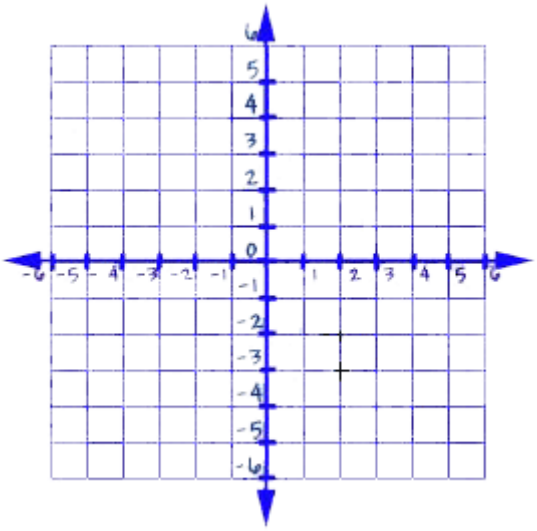
Example 2 – *Graphing a Quadratic Function with a Positive a-value*

a.) Sketch the graph of $y = x^2 - 1$ $a =$ _____ $b =$ _____ $c =$ _____



Vertex: _____

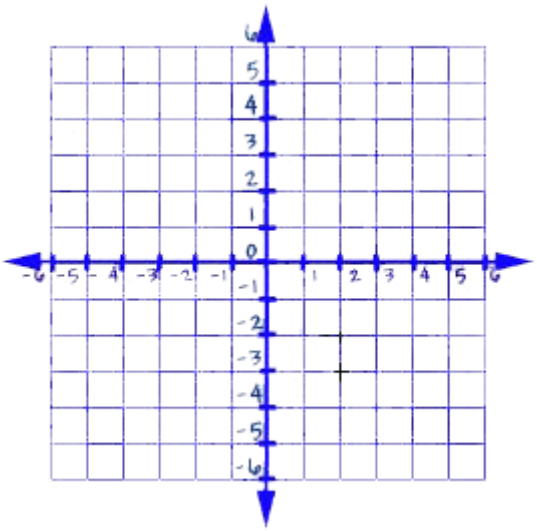
AOS: _____

Roots: _____

Opens: _____

x					
y					

b.) Sketch the graph of $y = -x^2 + 4x - 4$ $a =$ _____ $b =$ _____ $c =$ _____



Vertex: _____

AOS: _____

Roots: _____

Opens: _____

x					
y					

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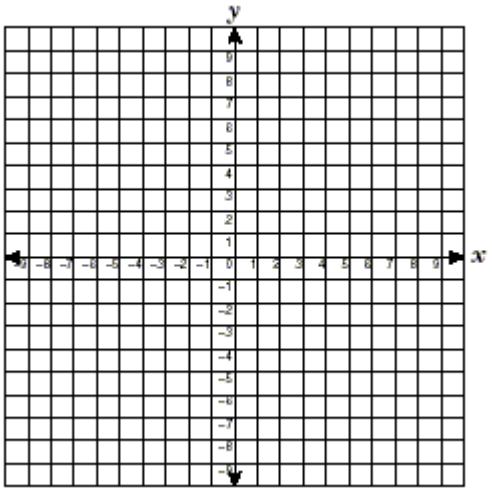
c.) Sketch the graph of $y = x^2 + 3$ a = _____ b = _____ c = _____



Vertex: _____

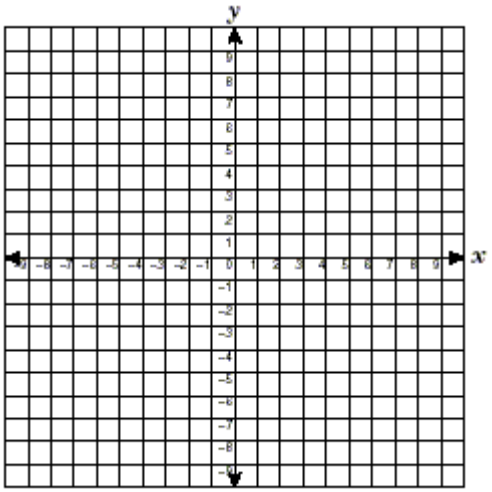
AOS: _____

Roots: _____

Opens: _____

x					
y					

d.) Sketch the graph of $y = 2x^2 + 8x$ a = _____ b = _____ c = _____



Vertex: _____

AOS: _____

Roots: _____

Opens: _____

x					
y					

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