Algebra 1: 11.1 Guided Notes **Name** _____ **Period** _____
Exploring Quadratic Functions

Learning Goals:
Graph a quadratic function using a table.
Analyze the standard form of a quadratic function and use it to sketch its graph.

Review

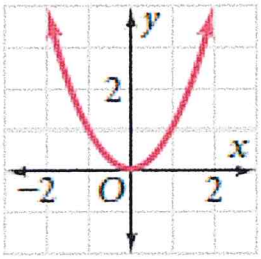
A **quadratic function** is a function that can be written in standard form, $y = ax^2 + bx + c$, where $a \neq 0$.

Examples: $y = 5x^2$ $y = x^2 + 7$ $y = x^2 - x - 3$

The simplest quadratic function is the quadratic parent function: $f(x) = x^2$ or $y = x^2$

The graph of a quadratic function is a U-shaped curve called a **parabola.**

The graph of $y = x^2$:



The line that divides a parabola into two matching halves is called the **axis of symmetry.**

It is the x-coordinate of the vertex.

The turning point of a parabola is the **vertex**. When the vertex is the lowest point, it is called a **minimum**.

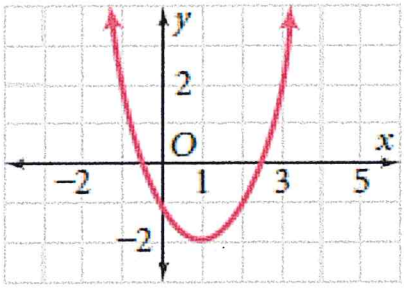
When the vertex is the highest point, it is called a **maximum**.

If a > 0 or positive, then	If a < 0 or negative, then
Parabola opens **up.**	Parabola opens **down.**
Vertex is a **minimum**.	Vertex is a **maximum**.

Identifying a Vertex and the Axis of Symmetry

Identify the vertex and the axis of symmetry for each graph. Tell whether the vertex is a maximum or minimum.

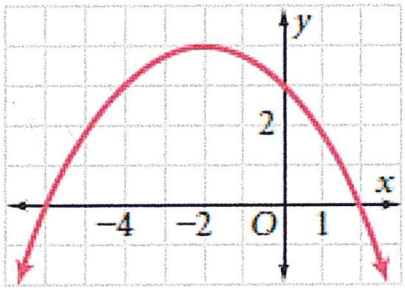
a.



Vertex is (1, -2) and it is a minimum.

Axis of symmetry is $x = 1$.

b.



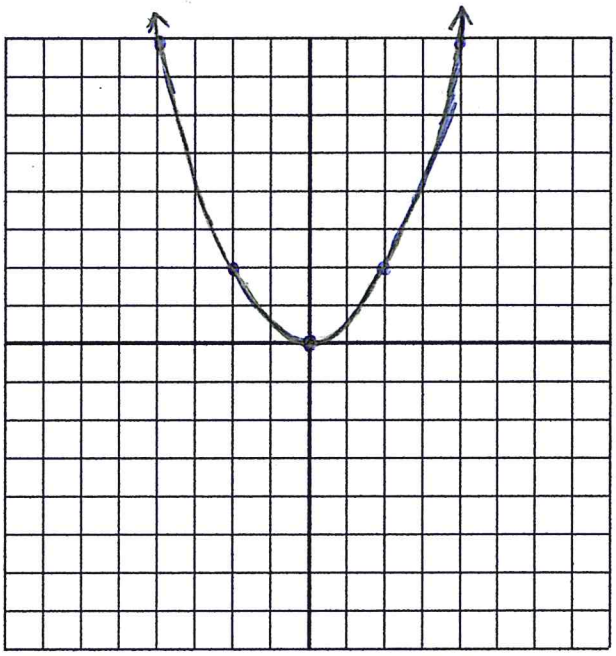
Vertex is (-2, 4) and it is a maximum.

Axis of symmetry is $x = -2$.

Graphing $y = ax^2$

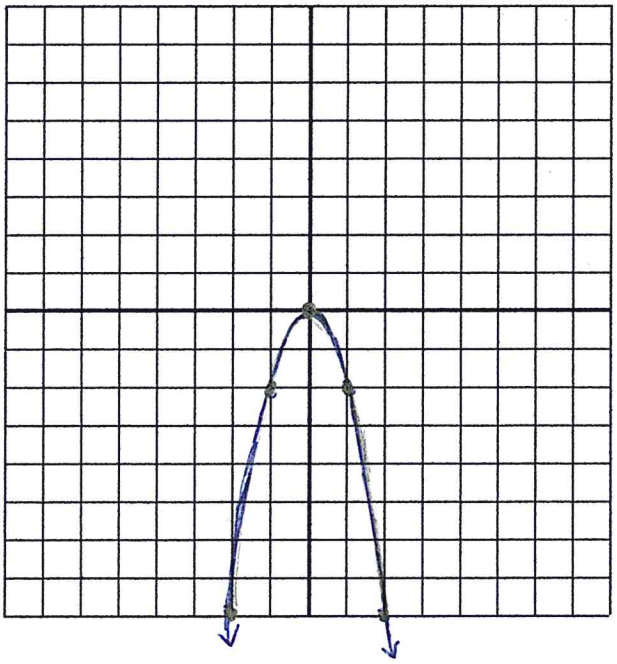
Graph the quadratic function $y = \frac{1}{2}x^2$

x	$y = \frac{1}{2}x^2$	(x, y)
-4	$\frac{1}{2}(-4)^2 = 8$	(-4, 8)
-2	$\frac{1}{2}(-2)^2 = 2$	(-2, 2)
0	$\frac{1}{2}(0)^2 = 0$	(0, 0)
2	$\frac{1}{2}(2)^2 = 2$	(2, 2)
4	$\frac{1}{2}(4)^2 = 8$	(4, 8)



Graph the quadratic function $y = -2x^2$

x	$y = -2x^2$	(x, y)
-2	$-2(-2)^2 = -8$	(-2, -8)
-1	$-2(-1)^2 = -2$	(-1, -2)
0	$-2(0)^2 = 0$	(0, 0)
1	$-2(1)^2 = -2$	(1, -2)
2	$-2(2)^2 = -8$	(2, -8)



For the quadratic function, $y = ax^2 + bx + c$, how does the value of "a" change the width of the parabola?

The value of "a" changes the shape of the parabola.

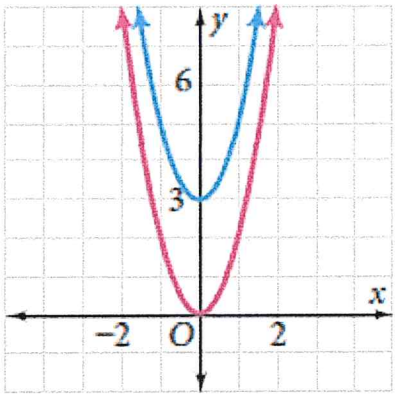
If $|a| < 1$ (think fractions!), the graph is wider.

If $|a| > 1$, the graph is narrower or skinnier.

Graphing $y = ax^2 + c$

How do the graphs of $y = 2x^2 + 3$ and $y = 2x^2$ compare?

x	$y = 2x^2$	$y = 2x^2 + 3$
-2	8	11
-1	2	5
0	0	3
1	2	5
2	8	11



The graph of $y = 2x^2 + 3$ has the same shape as the graph of $y = 2x^2$, but it is shifted up 3 units.

For the quadratic function, $y = ax^2 + bx + c$, how does the value of "c" change the graph of the parabola?

The value of "c" shifts the graph up or down "c" units.

If $c > 0$, the graph moves up c units.

If $c < 0$, the graph moves down c units.

Remember, "c" is also the *y*-intercept because when $x = 0$, $y = a(0)^2 + b(0) + c$ or $y = c$.