

Algebra 1B

Name _____

10.1-10.3 Graphing Quadratic Functions Introduction

Recall: $y = mx + b$ is a linear function and its graph is a line.

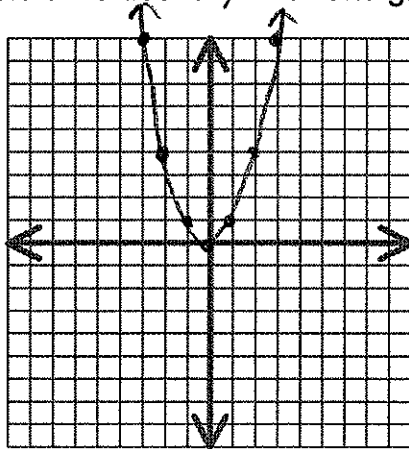
All functions of the form $y = ax^2 + bx + c$ are quadratic functions, because it has x^2 .

Graphing Activity (Part 1)

o Complete the table of values for $y = x^2$ and graph the function.

$y = x^2$

x	y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9
4	16



> This graph of a quadratic function is called a

Parabola.

> The minimum point is called the

vertex.

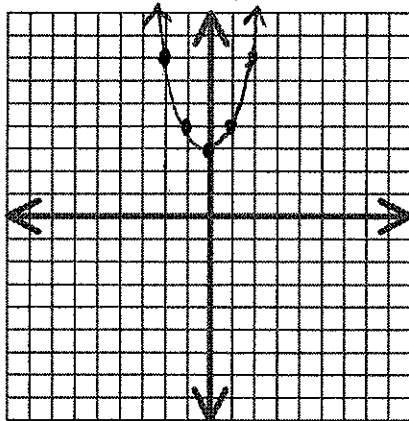
The vertex for

$y = x^2$ is (0,0).

o Now let's graph $y = x^2 + 3$ and $y = x^2 - 4$.

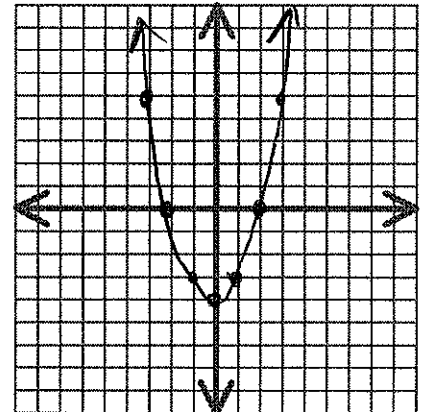
$y = x^2 + 3$

x	y
-3	12
-2	7
-1	4
0	3
1	4
2	7
3	12
4	19



$y = x^2 - 4$

x	y
-3	5
-2	0
-1	-3
0	-4
1	-3
2	0
3	5
4	12



Vertex: (0,3)

Vertex: (0,-4)

What effect does "c" in the equation $y = ax^2 + bx + c$ have on the graph?

Shifts the graph up or down

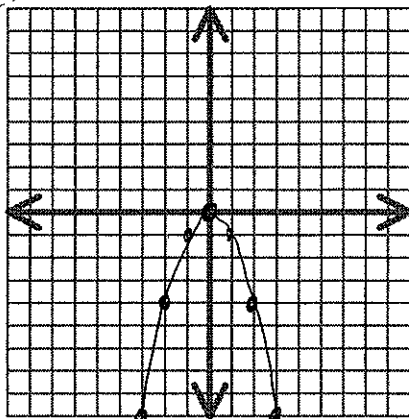
o Now graph $y = x^2 + 3x + 2$ and $y = x^2 - x - 6$ on new graph paper. Make a table for each equation to graph each. Then note the vertex, y-intercept, and x-intercept(s). Remember, plug in 0 for y and solve for x, if you don't see the x-intercepts in your table.

Graphing Activity (Part 2)

- o Now let's graph $y = -x^2$ and $y = -x^2 + 3$.

$$y = -x^2 - (-3) \rightarrow 9$$

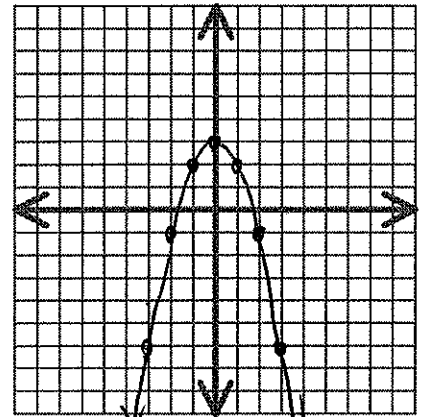
x	y
-3	-9
-2	-4
-1	-1
0	0
1	-1
2	-4
3	-9
4	-16



Vertex: $(0,0)$; y-int: $(0,0)$

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

x	y
-3	-6
-2	-1
-1	2
0	3
1	2
2	-1
3	-6
4	-13



Vertex: $(0,3)$; y-int: $(0,3)$

Notice the vertex is now a Maximum rather than a minimum!

What effect does "a" in the equation $y = ax^2 + bx + c$ have on the graph?

If a is negative, the graph flips over the x-axis (Opens Down)

- o Now let's graph $y = -x^2 + 4x - 3$

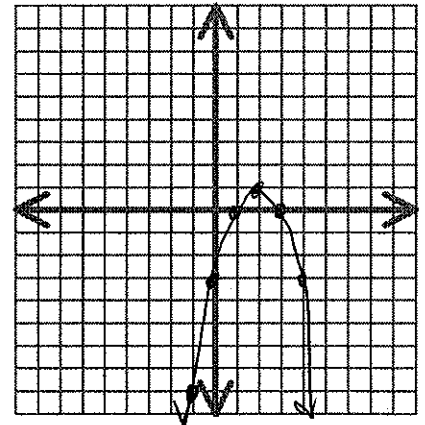
Before graphing the function, answer these questions:

- 1) Will the parabola open up or down? Down
- 2) What will the y-intercept be? $(0, -3)$

After graphing the function, identify more characteristics:

- 3) What is the vertex? $(2, 1)$
- 4) What are the x-intercepts? $(1, 0)(3, 0)$

x	y
-3	-24
-2	-15
-1	-8
0	-3
1	0
2	1
3	0
4	-3



- o Now graph $y = 2x^2 - 4x - 5$; $y = -2x^2 + x + 1$; and $y = x^2 + 2x - 8$ on new graph paper. Identify the **y-intercept** and **direction of opening** of each BEFORE graphing. Make a table for each equation to graph each. Lastly, note the **vertex** and **x-intercept(s)**.

Graphing Activity (Part 3)

Parabolas demonstrate **symmetry** on either side of its vertex. Therefore, to efficiently graph a parabola, it is helpful to identify its vertex first!

To graph a parabola efficiently:

STEP 1:	Identify the direction of opening and y-intercept
STEP 2:	Find the vertex 1.) Calculate $-\frac{b}{2a}$. This is the x-value of the vertex. 2.) Find the y-value of the vertex (plug the x-value into the function).
STEP 3:	Construct a table using 2 x-values <i>above</i> and 2 x-values <i>below</i> the vertex.
STEP 4:	Graph the parabola.
STEP 5:	Identify the x-intercepts , if possible.

Try graphing these quadratic functions:

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

Direction: Up $x = \frac{-6}{2(1)}$
 y-intercept: (0, 8) $x = -3$

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

$y = (-3)^2 + 6(-3) + 8$
 vertex $y = 9 - 18 + 8$
 $y = -1$

x-int (-4, 0) + (-2, 0)

3.) $y = -x^2 - 4x + 12$

Direction: down
 y-intercept: (0, 12)

x	y
-4	12
-3	15
-2	16
-1	15
0	12

$x = \frac{4}{2(-1)}$
 $x = -2$
 $y = 16$
 vertex

x-int (2, 0) (-6, 0)

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

Direction: Up
 y-intercept: (0, -5)

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

Can't see x-int

4.) $y = -2x^2 + 8x - 7$

Direction: down
 y-intercept: (0, -7)

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

vertex

Can't see x-int