

Day 3 - Graphing Quadratics in Vertex Form

reflects

Vertex Form of a Quadratic Function:  
 $y = a(x - h)^2 + k$

$a > 1$  stretch  
 $0 < a < 1$  shrink

$a$  determines how the graph opens  
 positive  $a$ , graph opens up ☺  
 negative  $a$ , graph opens down ☹  
 ( $h$ ,  $k$ ) is our vertex.

**NOTE:** Our vertex is at ( $h$ ,  $k$ ), **NOT** ( $-h$ ,  $k$ ).

Identifying the Vertex Practice

Find the vertex of the following:

- 1)  $y = (x - 18)^2 - 9$  Vertex = (18, 9)
- 2)  $y = 4(x + 6)^2 - 7$  Vertex = (-6, -7)
- 3)  $y = (x - 2)^2 - 2$  Vertex = (2, -2)

Find the vertex for each of the following quadratics and determine whether the graph opens up or down:

- a)  $y = (x - 1)^2 - 2$  Vertex = (1, -2) Graph Opens up because  $a$  is +
- b)  $y = -3(x + 4)^2 + 1$  Vertex = (-4, 1) Graph Opens down because  $a$  is -
- c)  $y = 2x^2 - 3$  Vertex = (0, 3) Graph Opens up because  $a$  is +
- d)  $y = -(x - 3)^2$  Vertex = (3, 0) Graph Opens down because  $a$  is -

**Steps for Graphing in Vertex Form**

- 1) Find the vertex (h, k).
- 2) Use your vertex as the center for your table and determine two x values to the left and right of your h value and substitute those x values back into the equation to determine the y values.

- Using practice problem number 3, let's practice filling in our table.

$$y = (x - 2)^2 - 2$$

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

$$y = (0 - 2)^2 - 2$$

$$= (-2)^2 - 2$$

$$= 4 - 2$$

$$y = 2$$

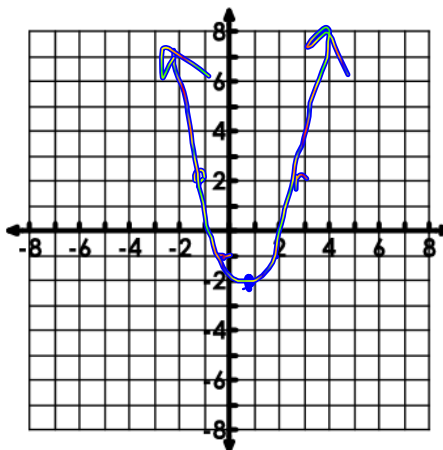
- 3) Plot your points and connect them from left to right!

**Graphing in Vertex Form Examples**

**Example 1:** Graph  $y = (x - 1)^2 - 2$ .

Vertex = ( 1 , -2 )

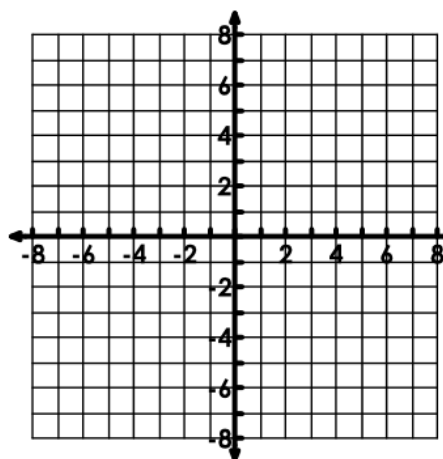
x	-1	0	1	2	3
y	2	-1	-2	-1	2



**Example 2:** Graph  $y = -3(x + 4)^2 + 1$ .

Vertex = ( -4 , 1 )

x	-6	-5	-4	-3	-2
y	-11	-2	1	-2	-11



Algebra 1

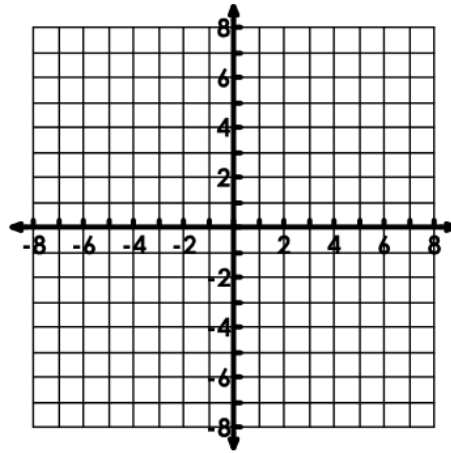
Unit 6: Quadratic Functions

Notes

**Example 3:** Graph  $y = 2x^2 + 3$ .

Vertex = (\_\_\_\_, \_\_\_\_)

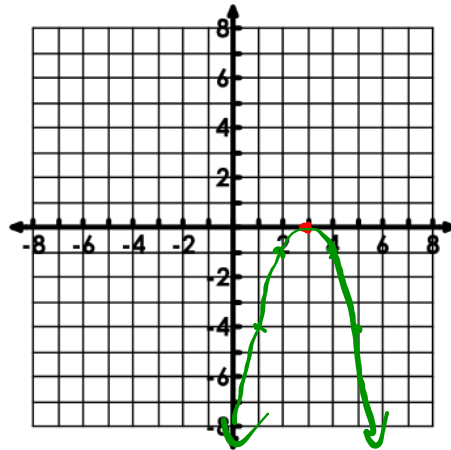
x					
y					



**Example 4:** Graph:  $y = -(x - 3)^2$ .

Vertex = (3, 0)

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



**Using a Graphing Calculator to Graph Quadratics in Vertex Form**

Use a graphing calculator to graph our last example problem, example 4:  $y = -(x - 3)^2$

1. Hit **Y =** and enter the equation into  $y_1$ .
2. Hit **Graph** (Hit **Zoom**, then **6** to get back to a standard viewing window, if necessary).
3. You can also use the table on the graphing calculator to compare to your table and note the symmetry along the vertex. Hit **2<sup>nd</sup>** followed by **Graph** (you really want the Table feature). Scroll through the table until you find where the  $y_1$  values stop decreasing and begin increasing, the point it switches at is our vertex.