

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Vertex Form of a Quadratic**

UNIT QUESTION: How are real life scenarios represented by quadratic functions?

Today's Question: How do we graph quadratics in vertex form using transformations?  
MCC9-12.F.BF.3

$$y = a(x - \underline{h})^2 + \underline{k}$$

**Vertex: (h,k)****Vertex:** The middle point of the graph also know at the maximum or minimum of the parabola.

You can think of functions as families. We know that families share certain characteristics. These characteristics are based on the parents and functions have a parent function. The parent function for a quadratic is  $f(x) = x^2$ . If we wrote that function in vertex form, then we would have  $f(x) = (x - 0)^2 + 0$ . Each term is a characteristic of the graph and these characteristics transform the parent function. Vertex form helps us to identify these characteristics.

Type of Transformation	Notation	Change to Graph
Vertical Shift <i>y values</i>	$\pm K$	$+K$ Move Up $-K$ Move Down
Horizontal Shift <i>x values</i>	$\pm h$	$+h$ Left $-h$ Right
Reflection over X axis <i>y values</i>	$\overline{a}$	flip graph over X axis
Vertical Stretch and Shrink <i>y values</i>	$a$	$a > 1$ Stretch "tall skinny" $0 < a < 1$ shrink fractions "short & fat"

Examples:

Describe the transformations of the parent graph for each equation.

1.  $f(x) = x^2 + 7$   
up 7

2.  $f(x) = -(x+5)^2 - 2$   
Reflection Left down

3.  $f(x) = \frac{1}{2}(x-10)^2$   
Shrink Right

Write the equation in vertex form of the quadratic equation that has been...

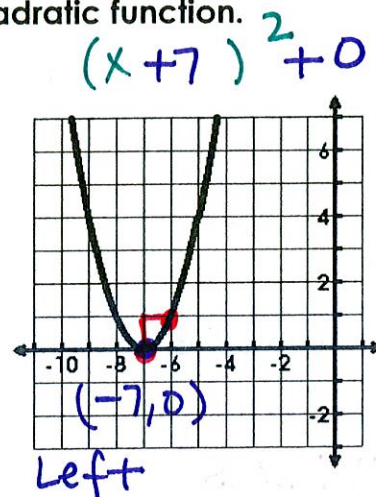
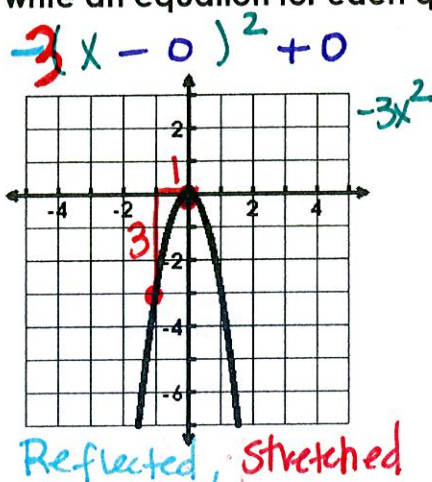
4. shifted to the right 2 and up 6  $(x-2)^2 + 6$

5. reflected over the x-axis and shifted left 8  $-(x+8)^2$

6. Stretch by 4, shifted right 4, and moved down 17  $4(x-4)^2 - 17$

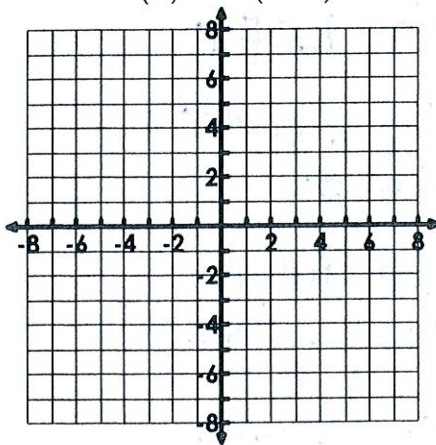
Describe the transformations and write an equation for each quadratic function.

1. Identify Vertex
2. Identify any Reflections
3. Stretches/Shrinks
  - a. In the parent function, the next point after the vertex is over 1 and down 1
  - \*b. Identify slope from vertex to first point after vertex



Graph the following equations, and give the domain and range of each function.

$$f(x) = -3(x+1)^2 - 3$$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_