

NOTES: SECONDARY 2 HONORS

TRANSFORMATIONS ON QUADRATIC AND ABSOLUTE VALUE FUNCTIONS (3.3, 3.4)

Vocabulary

- The **parent function** is the basic function used to create the more complicated functions.
- The graph of a quadratic function is in the shape of a **parabola**. This is generally described as being “u” shaped.
 - The vertex form is $f(x) = a(x-h)^2 + k$ where the vertex is at (h, k) and the axis of symmetry is at $x = h$.
- The **absolute value function** is actually a piecewise-defined function consisting of two linear equations.
 - The vertex form is $f(x) = a|x-h| + k$ where the vertex is at (h, k) and the axis of symmetry is at $x = h$.

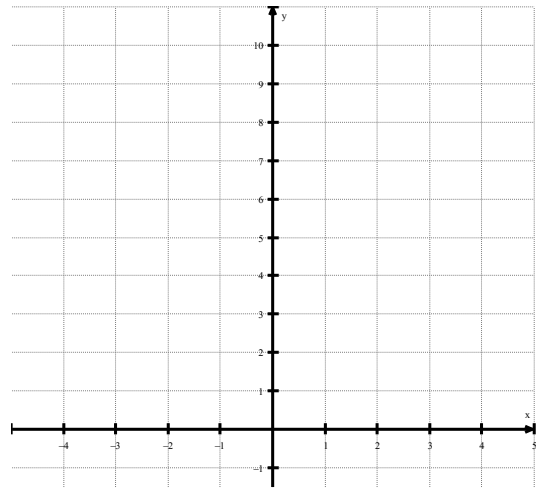
QUADRATIC PARENT FUNCTION

Equation: $y = x^2$

Table

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

Graph



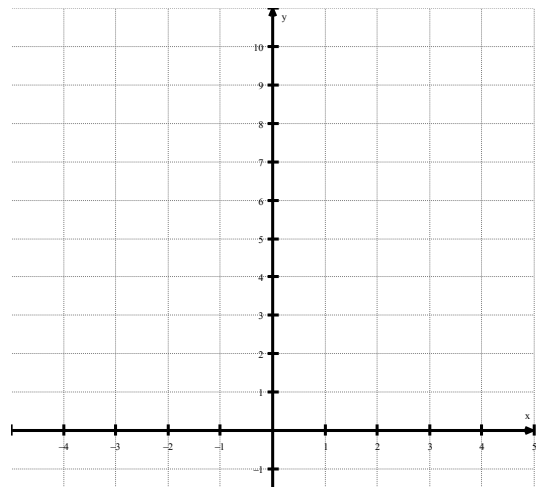
ABSOLUTE VALUE PARENT FUNCTION

Equation: $y = |x|$

Table

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

Graph



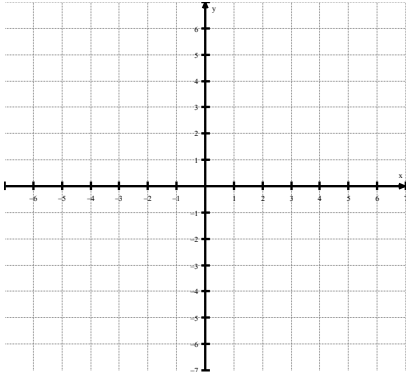
General Formula - Quadratic

$$f(x) = a(x - h)^2 + k$$

Examples: Describe the transformations performed on $f(x) = x^2$ to make it the following:

a. $f(x) = (x - 3)^2$

Transformation(s):



Axis of symmetry:

Vertex:

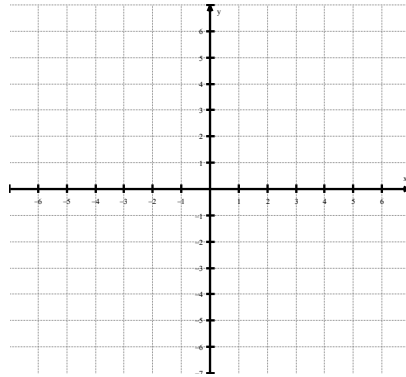
Domain:

Range:

Max/Min value:

b. $f(x) = x^2 + 2$

Transformation(s):



Axis of symmetry:

Vertex:

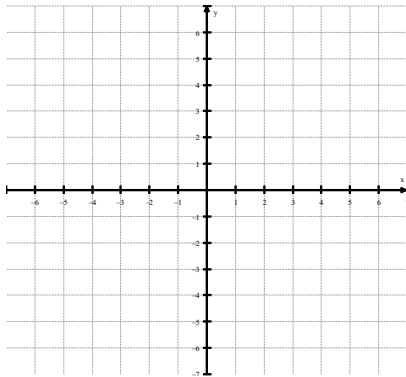
Domain:

Range:

Max/Min value:

c. $f(x) = (2x)^2$

Transformation(s):



Axis of symmetry:

Vertex:

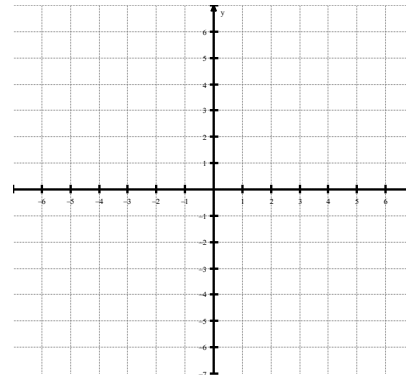
Domain:

Range:

Max/Min value:

d. $f(x) = 3x^2$

Transformation(s):



Axis of symmetry:

Vertex:

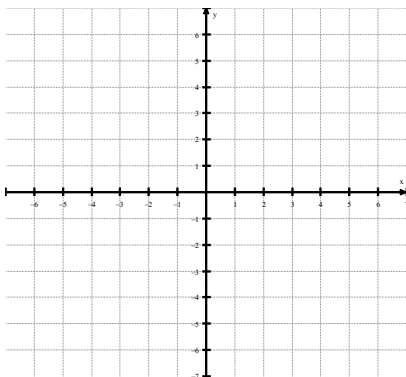
Domain:

Range:

Max/Min value:

e. $f(x) = -x^2$

Transformation(s):



Axis of symmetry:

Vertex:

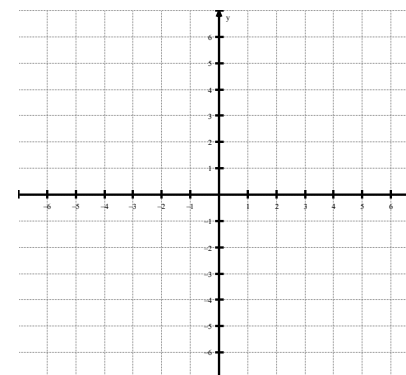
Domain:

Range:

Max/Min value:

f. $f(x) = \frac{1}{2}x^2$

Transformation(s):



Axis of symmetry:

Vertex:

Domain:

Range:

Max/Min value:

General Formula – Absolute Value

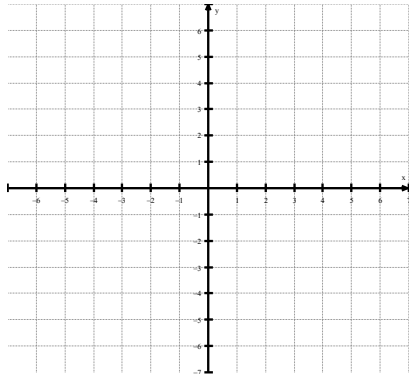
$$f(x) = a|x - h| + k$$

Examples: Describe the transformations performed on $f(x) = x^2$ to make it the following:

a. $f(x) = |x + 2|$

b. $f(x) = |x| - 4$

Transformation(s):



Axis of symmetry:

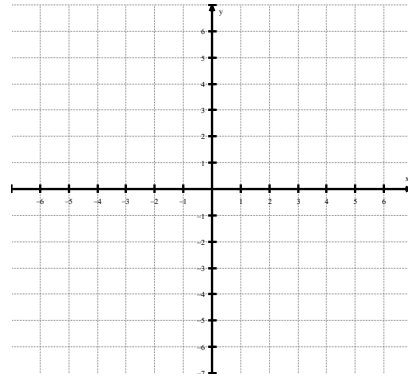
Vertex:

Domain:

Range:

Max/Min value:

Transformation(s):



Axis of symmetry:

Vertex:

Domain:

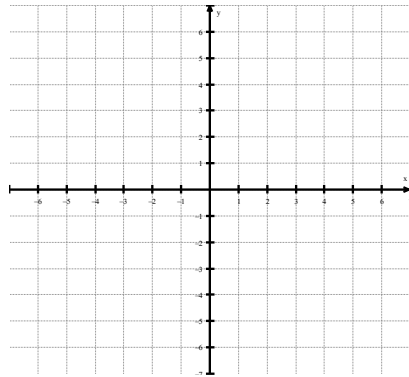
Range:

Max/Min value:

c. $f(x) = |2x|$

d. $f(x) = 3|x|$

Transformation(s):



Axis of symmetry:

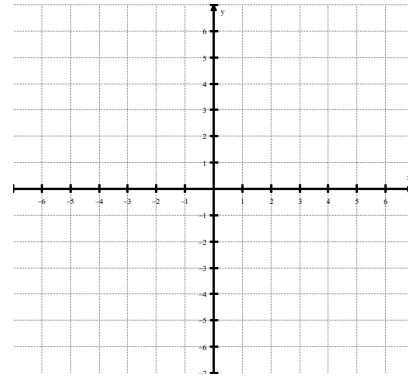
Vertex:

Domain:

Range:

Max/Min value:

Transformation(s):



Axis of symmetry:

Vertex:

Domain:

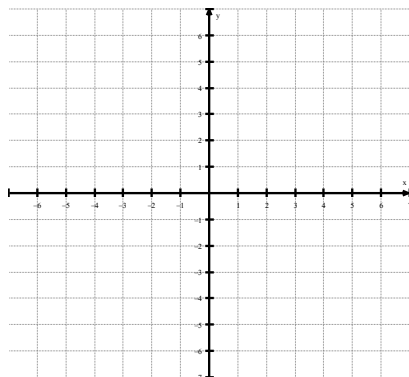
Range:

Max/Min value:

e. $f(x) = -|x|$

f. $f(x) = \frac{1}{2}|x|$

Transformation(s):



Axis of symmetry:

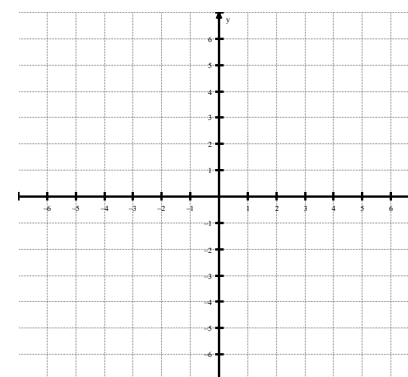
Vertex:

Domain:

Range:

Max/Min value:

Transformation(s):



Axis of symmetry:

Vertex:

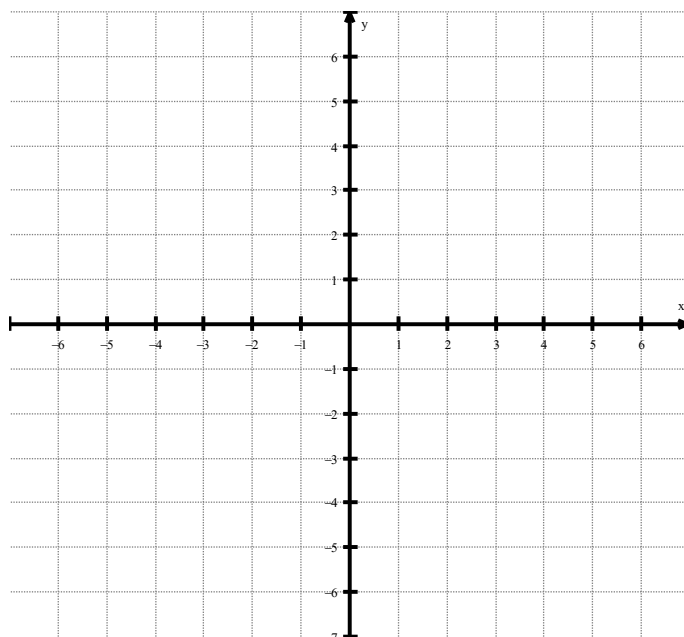
Domain:

Range:

Max/Min value:

When graphing multiple translations it is best to **StReSS**. StReSS is an acronym to help you remember the order to perform transformations. Always begin with the parent graph for the function, you then perform the **St** or the stretch; this refers to the a in the general formula, and could be a shrink or a stretch. After completing the stretch you reflect (**Re**) your graph. On quadratic functions, reflections are always across the x -axis. Once you have completed the **StRe** you finish with **SS**, this refers to shift-shift, or a vertical shift and a horizontal shift.

Example: Describe the transformations on $f(x) = x^2$ to make it $f(x) = -(x - 1)^2 + 5$. Then graph the function and identify the axis of symmetry, the vertex, the domain and the range. (HINT: you may want to graph the equation)



Example: Describe the transformations on $f(x) = |x|$ to make it $f(x) = -2|x - 3| + 5$. Then graph the function and identify the axis of symmetry, the vertex, the domain and the range. (HINT: you may want to graph the equation)

