Integrated Math 3 Name: _____
Unit 4: Representing Functions
3.4 Date:_____ Period:_____

Part I Objective: To discover patterns in graphing.

Warm up: What is the difference between even and odd functions?

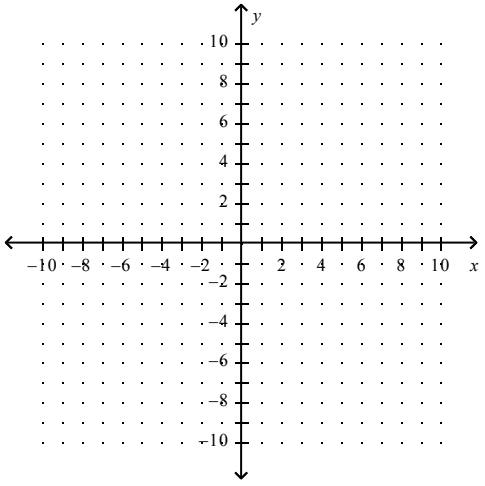
_____

_____

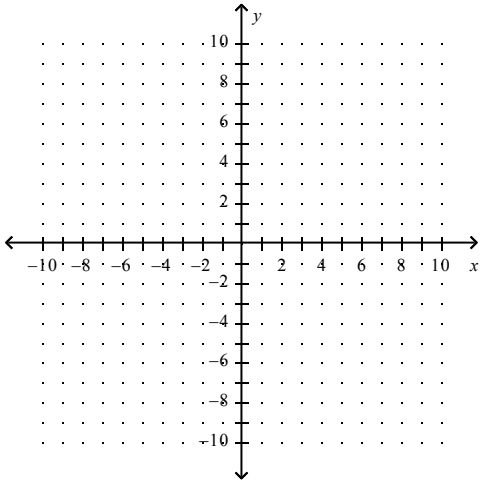
Using your graphing calculator, graph each of the following equations – you can get the absolute value on your calculator by pressing the MATH key, then arrow over to NUM and your first choice should be abs(then just press ENTER. **Be sure to close your parenthesis when the absolute value ends**.

Let's look at what happens when we add a number to the outside of the function:

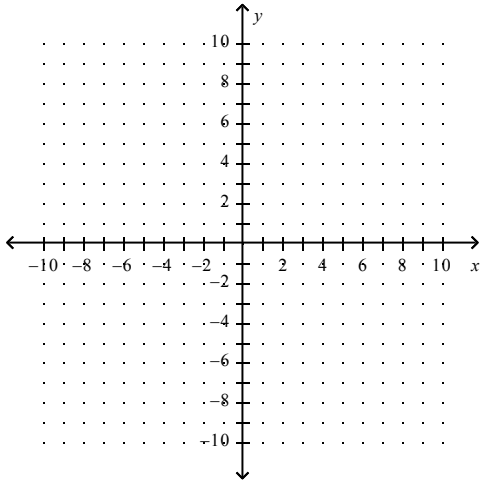
1. $f(x) = |x|$



2. $f(x) = |x| + 3$



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



What happens to the graph if you add a number to the outside of the function? Be very specific in how it changes based off of the provided equation.

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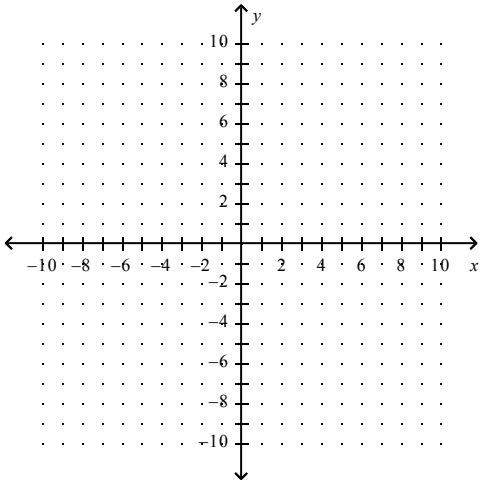
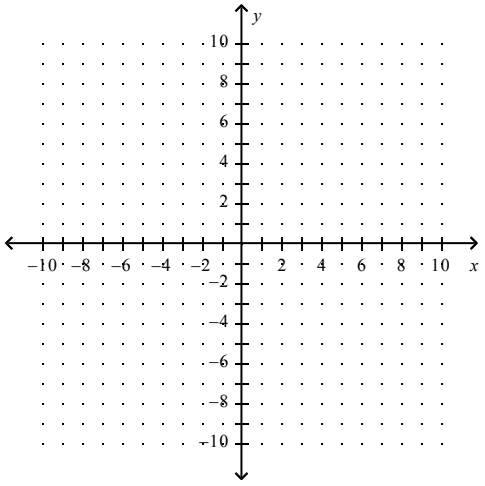
Let's look at what happens when we <u>add a number to the inside of the function</u>:

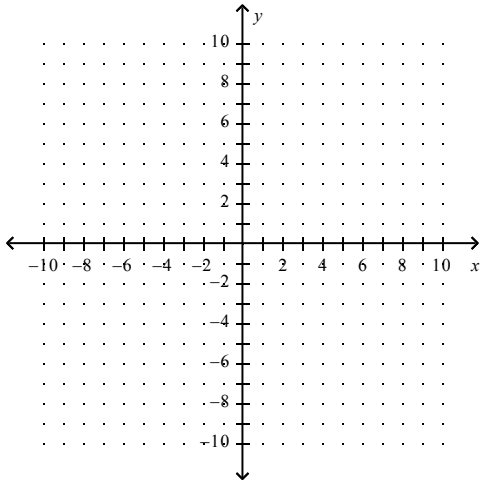
4. $f(x) = |x - 2|$



5. $f(x) = |x + 3|$



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



What happens to the graph if you add a number to the inside of the function? Be very specific in how it changes based off of the provided equation.

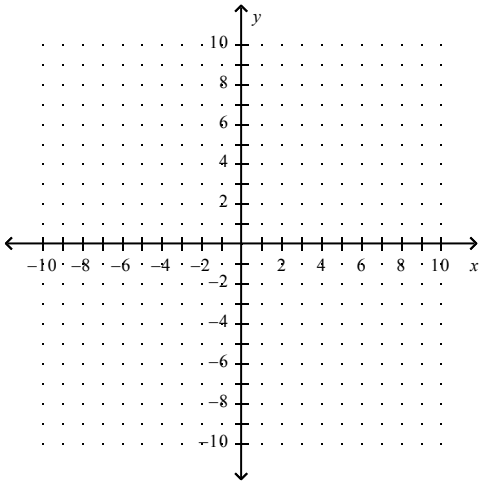
_____

_____

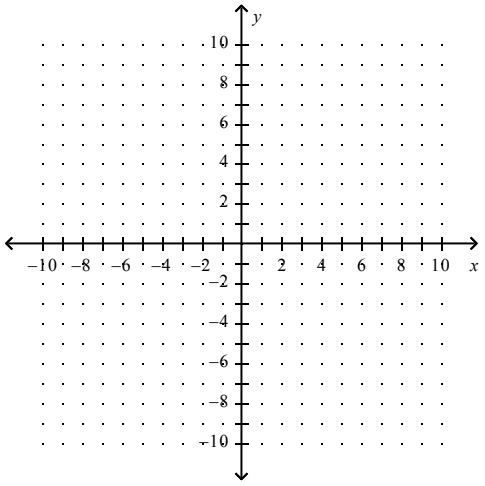
_____

Let's look at what happens when we <u>multiply a number</u> to the function:

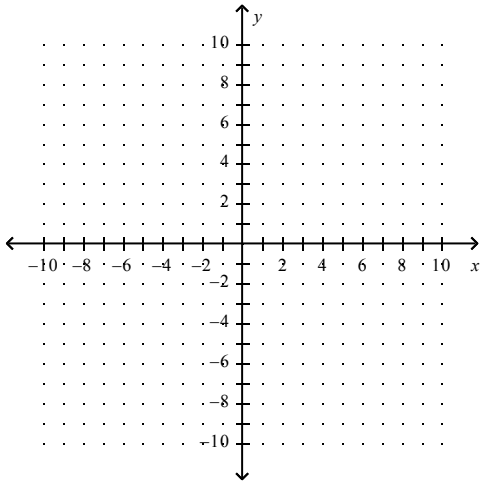
7. $f(x) = 3|x|$



8. $f(x) = 0.5|x|$



9. $f(x) = -2|x|$



What happens to the graph when you multiply a number to the function? Be very specific in how it changes based off of the provided equation.

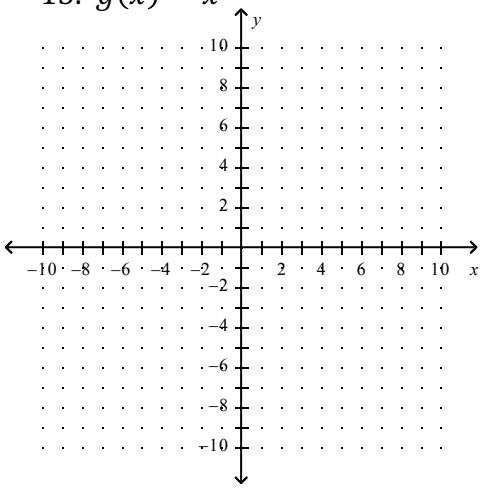
_____

_____

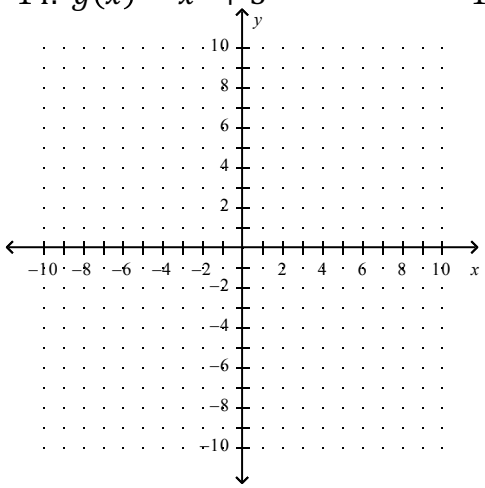
_____

Let's see if this is true for <u>quadratic</u> equations…

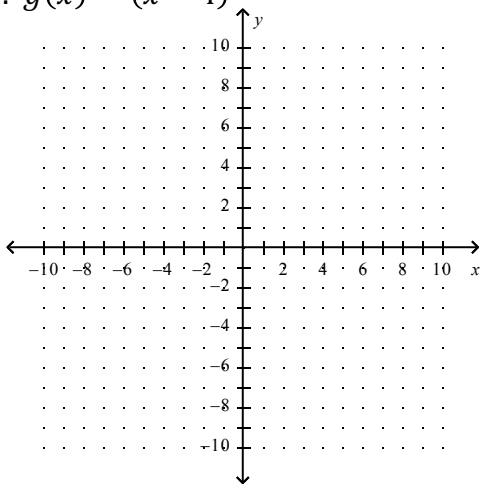
13. $g(x) = x^2$



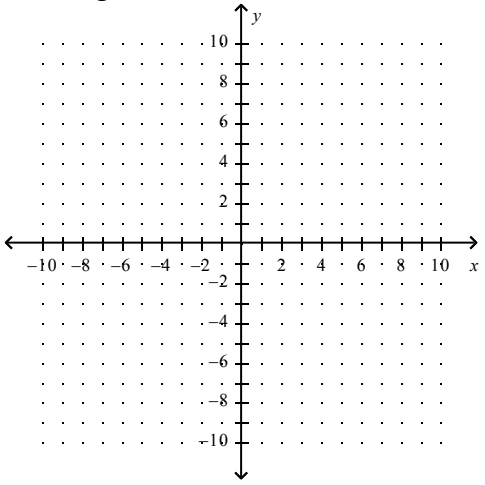
14. $g(x) = x^2 + 3$



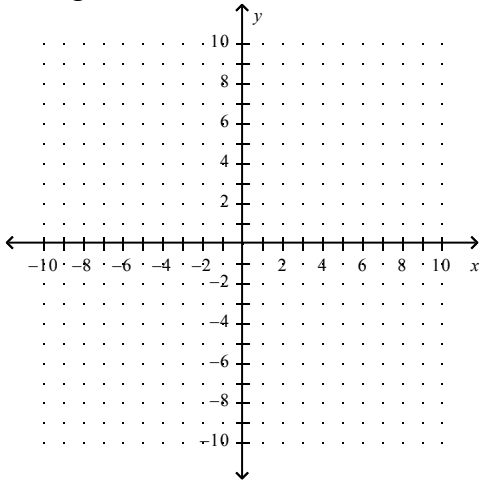
15. $g(x) = (x - 4)^2$



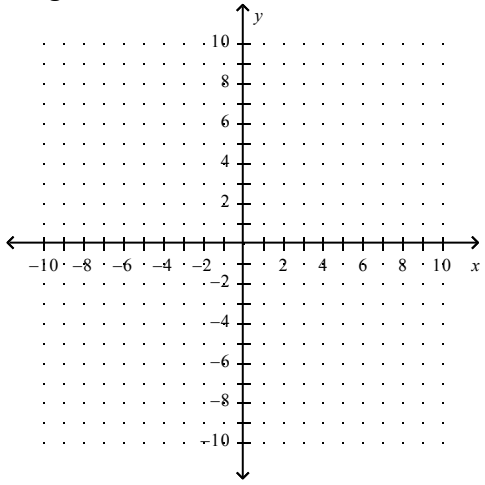
16. $g(x) = 2x^2$



17. $g(x) = (2x)^2$



18. $g(x) = -3(x)^2$



Explain the similarities and differences in the patterns between absolute value functions and quadratic functions. If there are none, write none.

	Similarities	**Diferences**
$f(x) = \|x\|$ and $g(x) = x^2$		
$f(x) = \|x\| + k$ and $g(x) = x^2 + k$		
$f(x) = \|x + k\|$ and $g(x) = (x + k)^2$		
$f(x) = k\|x\|$ and $g(x) = kx^2$		
$f(x) = \|kx\|$ and $g(x) = (kx)^2$		

Part II Objective: Analyzing and writing absolute value functions.

Warm Up:

1. Identify the distance each of the following values is from zero:

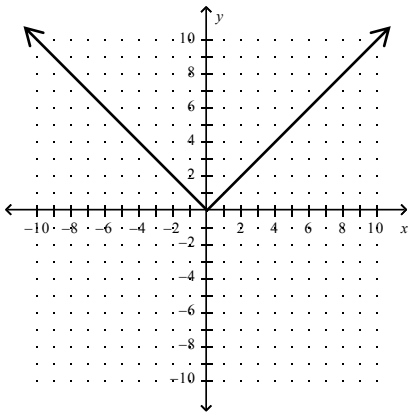
6 $\quad -6$ $\quad 3$ $\quad -3$ $\quad 4$ $\quad -4$

2. Identify the center of the circles given their equations.

$(x-3)^2+(y+2)^2=9$ $\qquad$ $x^2+(y-5)^2=16$

What is an Absolute Value Function?

An absolute value function, when graphed, is a function consisting of two rays whose ends meet at a common point, called the vertex, and extend into a "v" shape.



$$y = a|x - h| + k$$

Some Fun Facts About Absolute Value Functions:

- Absolute value functions are _____ around the y-axis
- For every point (x, y) existing on the graph, there exists the point _____
- The vertex _____ also indicates a _____ and/or a _____
- The coefficient _____ in front of the absolute value signs indicates the:
  - _____ of the two rays, which describes the overall _____ of the function
  - _____ of opening

Example 1: Identify the vertex, the steepness of the function and the direction of opening given the following absolute value functions:

A.) $y = |x|$

B.) $y = 3|x| - 2$

C.) $y = 2|x - 4| + 3$

D.) $y = |x + 5| + 1$

E.) $y = -|x - 1| + 6$

F.) $y = -\frac{1}{2}|x + 2| + 2$

Example 2: Write an absolute value function given the following properties.

A.) Has a vertex located at $(-3, 5)$

B.) Has a vertex located at $(0, -2)$ and opens down

C.) Has a vertex at $(0, 0)$ and has rays with slopes of 3

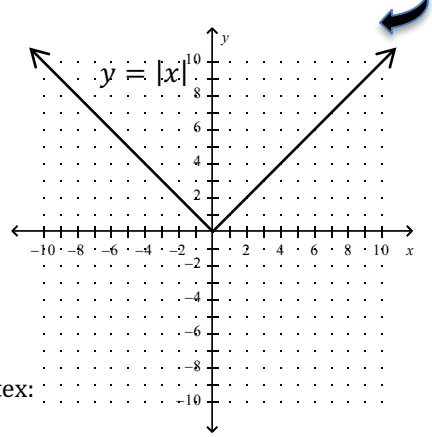
D.) Has a vertex at $(-4, 0)$, opens down and has rays with slopes of $\frac{1}{2}$

E.) Has a vertex at $(-3, -\frac{1}{2})$ and has rays with slopes of 2

Example 3: Given the graph of the absolute value function, identify the vertex, direction of opening, and the slopes of the rays. Explain how the graph transformed from the original $y = |x|$ graph. Finally, write an equation representing the graphed function.

The ORIGINAL (parent graph)

A.)

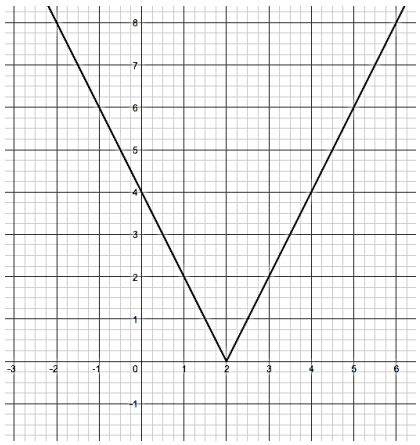


Vertex:

Slopes of Rays:

Direction of Opening:

B.)

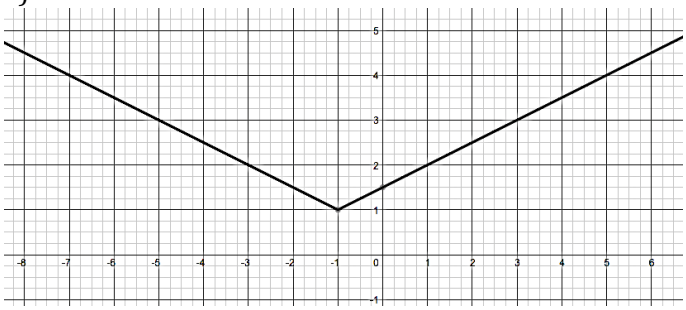


Vertex: Direction of Opening:

Slopes of Rays: Transformations:

Equation:

B.)

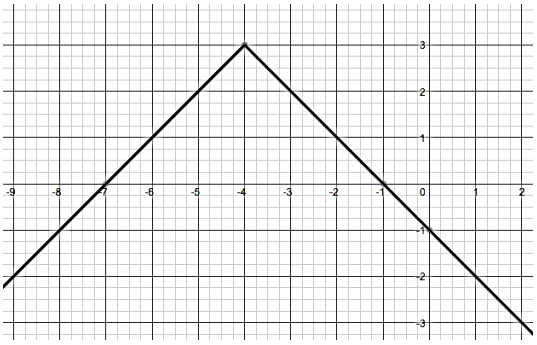


Vertex: Direction of Opening:

Slopes of Rays: Transformations:

Equation:

C.)

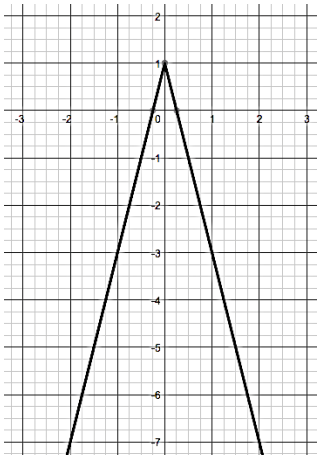


Vertex: Direction of Opening:

Slopes of Rays: Transformations:

Equation:

D.)

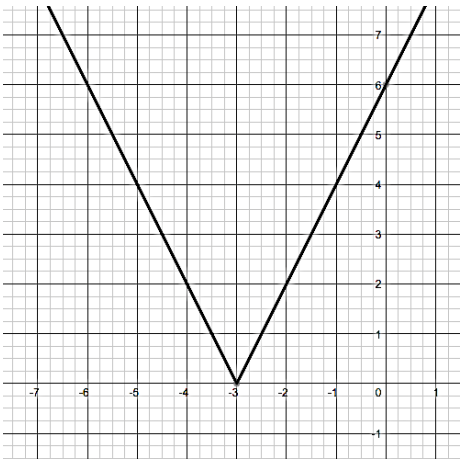


Vertex: Direction of Opening:

Slopes of Rays: Transformations:

Equation:

E.)



Vertex: Direction of Opening:

Slopes of Rays: Transformations:

Equation: