Name: _____ Date: _____

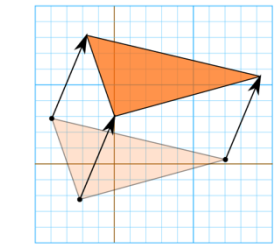
Translations and Reflections

Translation: A translation is "sliding." Moving an object/equation, without changing its' size or shape. (No flipping or rotating)

Moving up/down:

$f(x) + b$ (moved UP b units)

$f(x) - b$ (moved DOWN b units)



Moving left/right:

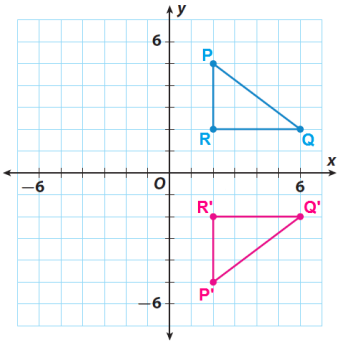
$f(x + h)$ (moved LEFT h units)

$f(x - h)$ (moved RIGHT h units)

Reflection: A reflection is "flipping." Flipping an object/equation about a line without changing its' shape or size.

Reflection over y-axis:

$f(-x)$



Reflection over x-axis:

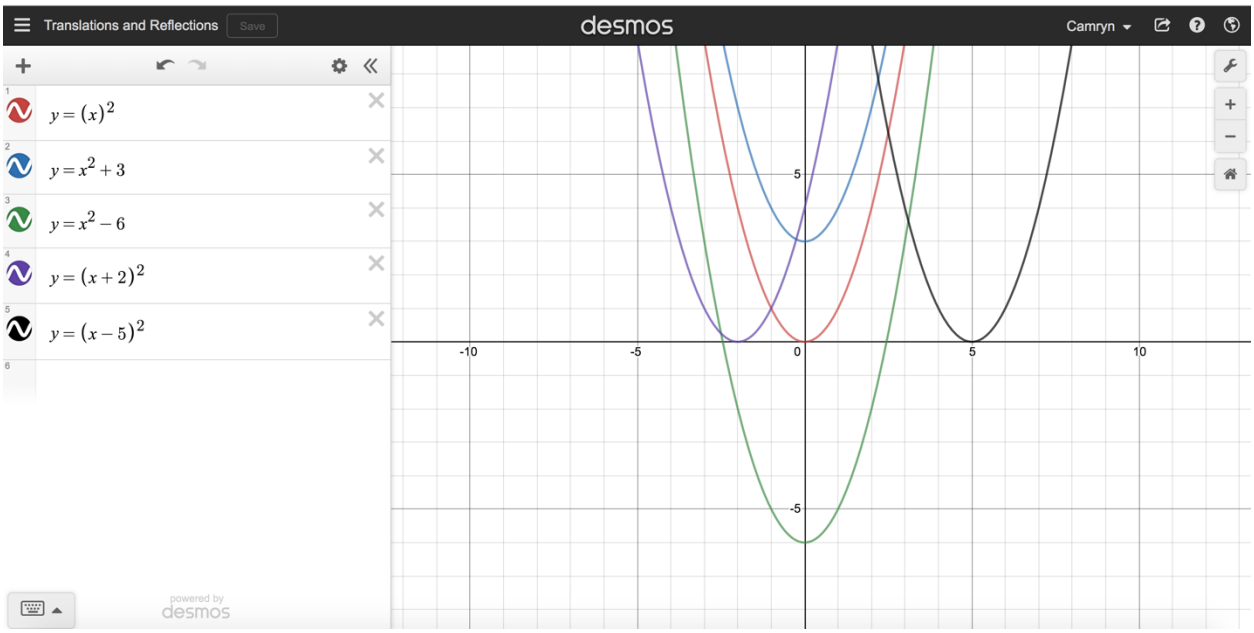
$-f(x)$

Open up: Desmos.com

Follow the given instructions to practice and observe what translations and reflections looks like on a graph.

1. Type in equation: $y = x^2$
    a. First, Translations:
        i. Move equation 3 units up. $y = x^2 + 3$
        ii. Move equation 6 units down. $y = x^2 - 6$
        iii. Move equation 2 units left. $y = (x + 2)^2$
        iv. Move equation 5 units right. $y = (x - 5)^2$

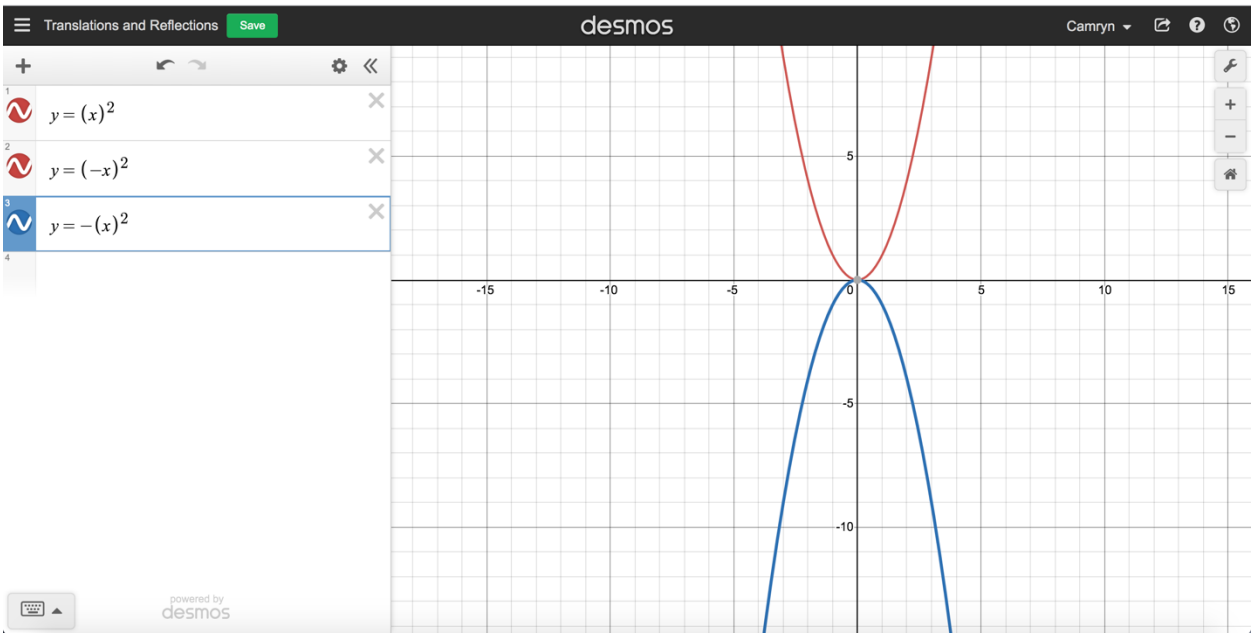
Your graph should look something like this:



b. Next, Reflections:
   i. Reflect over y-axis (y=0) $y=(-x)^2$
   ii. Reflect over x-axis (x=0) $y=-(x^2)$

Your graph should look something like this:

** $y=(-x)^2$ is reflection over the y-axis, which will produce a graph that looks the same because of its symmetry. **

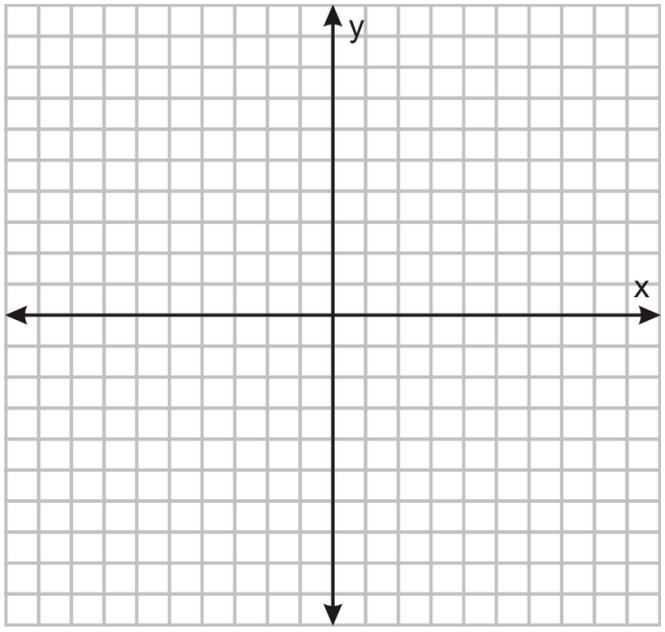


Practice Problems:

Graph the following functions, according to their translations and reflections. You may use Desmos to check your answer. Lastly, write what translation or reflection is happening (ex. 4 units up, reflected over y-axis).

1. **Original: $y = |x|$**

Graph: $y = -|x| + 1$

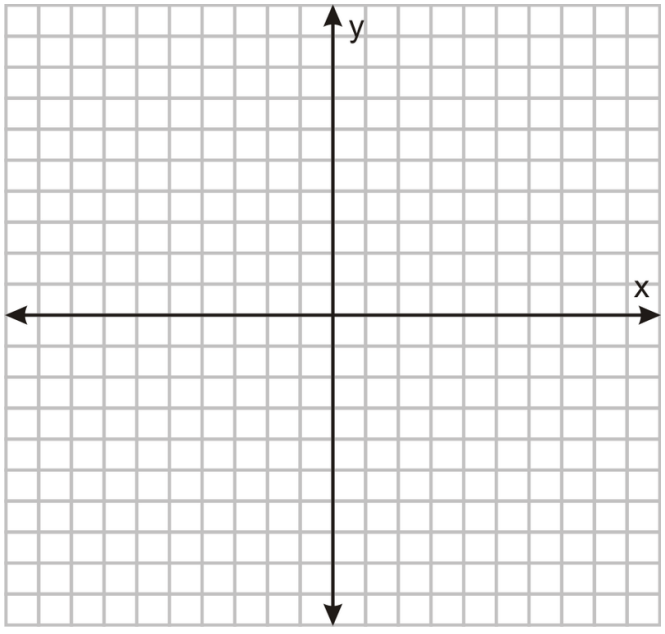


What translations and reflections were applied?

_____

2. **Original: $y = x^3$**

Graph: $y = (-x + 2)^3 - 5$

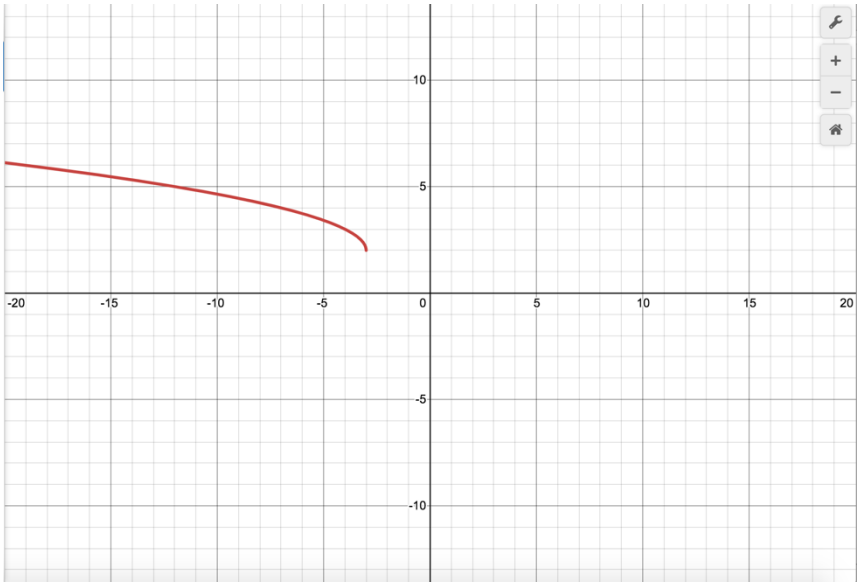


What translations and reflections were applied?

_____

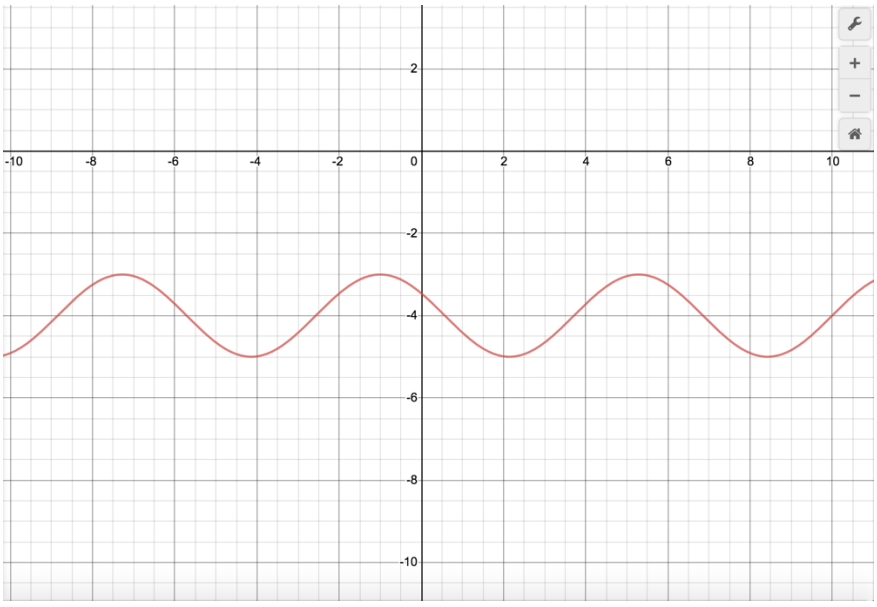
For the following, the graph is provided with reflections and transformations applied. Provide the new equation based on the graph given.

3. **Original: $y = \sqrt{x}$**



New equation: _____

4. **Original $y = cos(x)$**



New equation: _____