1.2 Reflecting Graphs

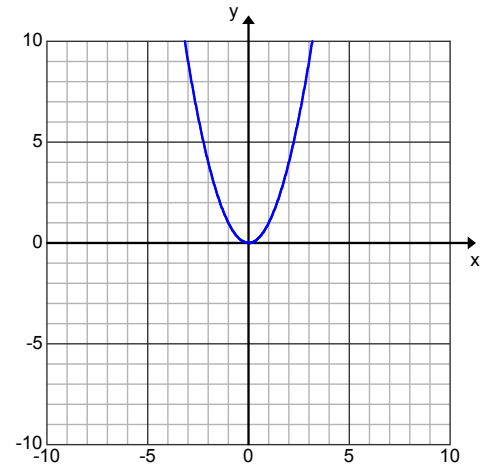
- Graphs can be reflected 3 different ways (over the x-axis, y-axis, & the line y=x)

1. Reflecting over the *x-axis*

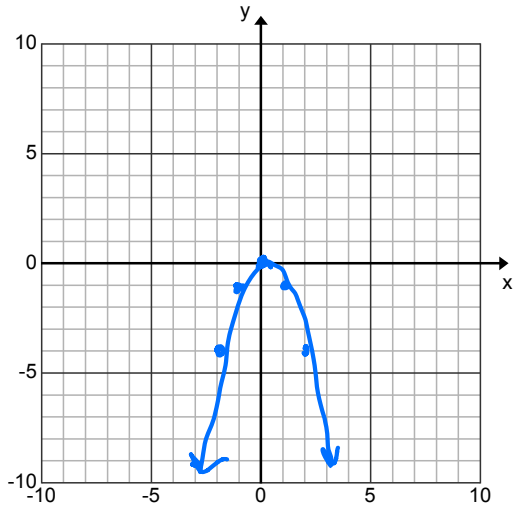
$y = a(x-p)^2 + q$

Graph:

$y = x^2$



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

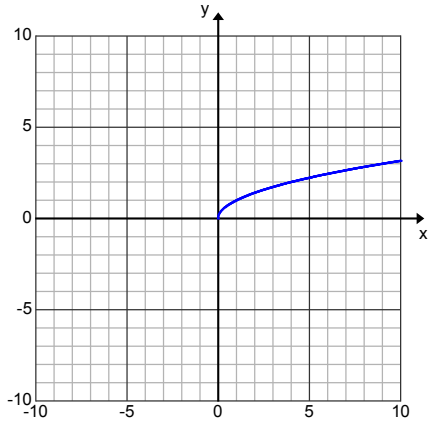


All y-values multiplied by (-1)

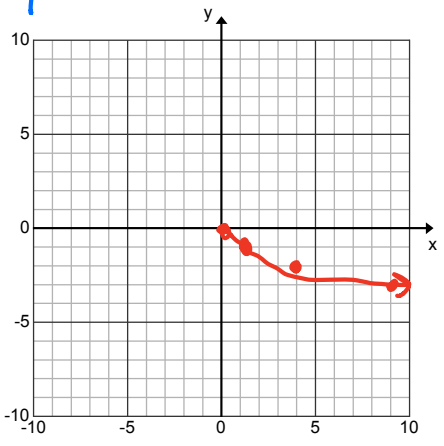
In Pre-Calc 11 we looked at the idea of placing the vertex and then determining the direction of opening. Another way of looking at the function is to multiply the y values by -1. We say that the graph has been reflected **over the x-axis.**

This process works with any function:

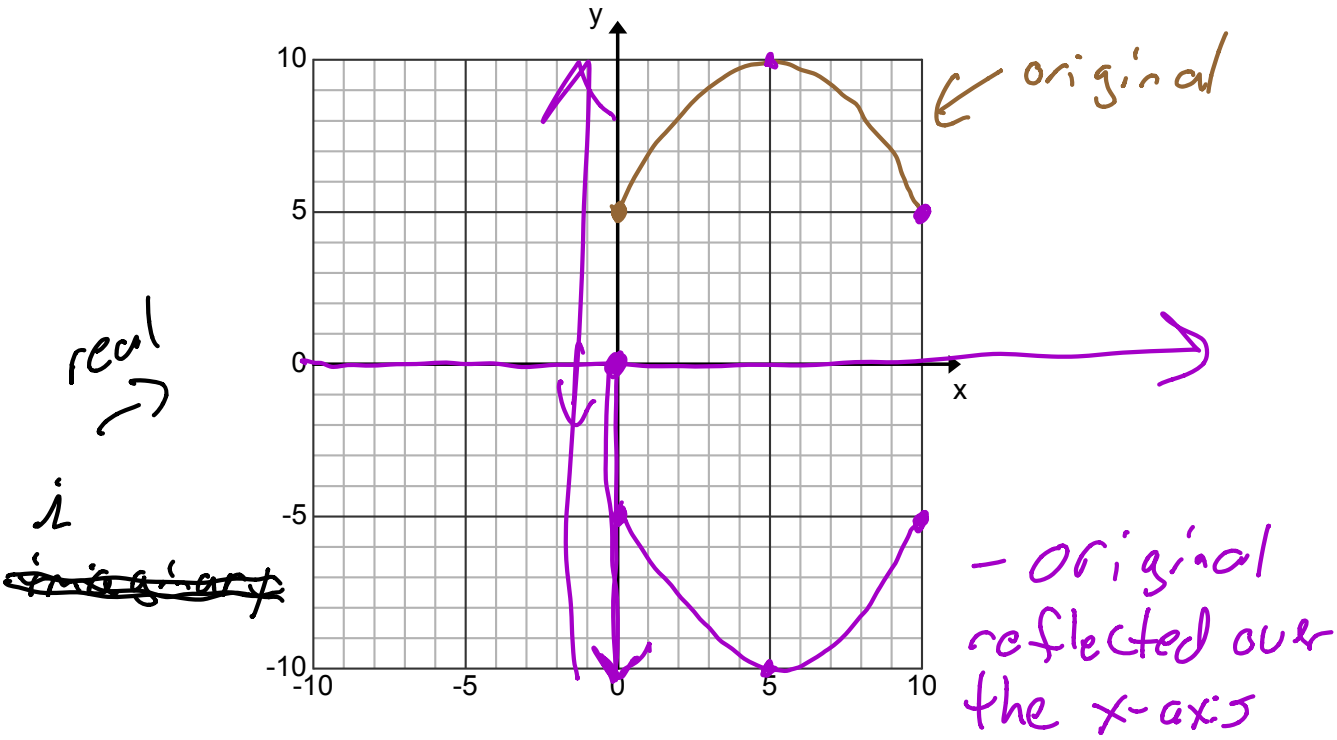
$y = \sqrt{x}$



$y = -\sqrt{x}$ or $-y = \sqrt{x}$



This also works for general functions (f(x), g(x), k(x)…). For example, given the graph of $y = f(x)$ sketch a graph of $y = -f(x)$



Points on graphs can be reflected as well.

Ex. The point (2, 3) is on the graph of $y = f(x)$ then what point must be on the graph of $y = -f(x)$? (2, -3)

In general: The function $y = f(x)$ with the function $y = -f(x)$ has been reflected over the *x-axis.* This process can affect: domain/range, the graph itself, individual points.

original

$\{x \mid 0 \le x \le 10, x \in \mathbb{R}\}$

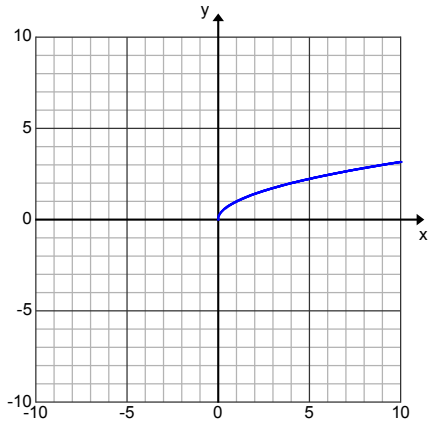
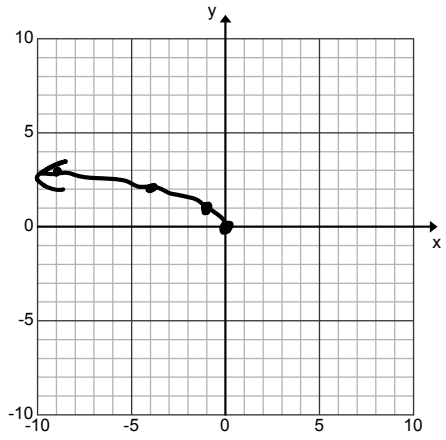
$\{y \mid 5 \le y \le 10, y \in \mathbb{R}\}$

reflection

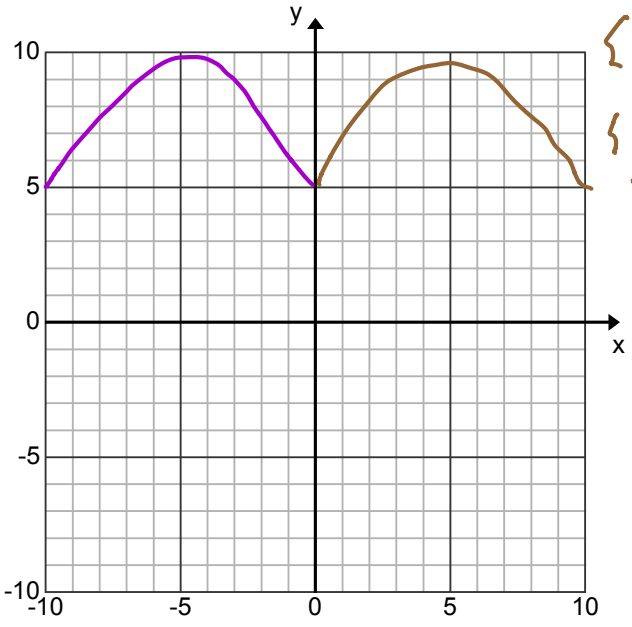
$\{x \mid 0 \le x \le 10, x \in \mathbb{R}\}$

$\{y \mid -10 \le y \le -5, y \in \mathbb{R}\}$

2. Reflecting over the **y-axis**

$y=\sqrt{x}$	$y=\sqrt{-x}$
	
All x values are multiplied by (-1)	

This also works for general functions (f(x), g(x), k(x)…). For example, given the graph of $y=f(x)$ sketch a graph of $y=f(-x)$



{x| -10≤x≤0, x∈ℝ}

{y| 5≤y≤10, y∈ℝ}

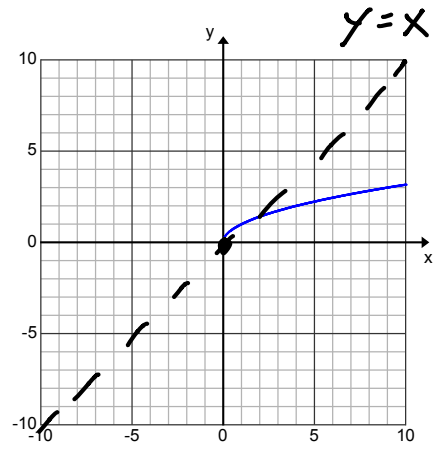
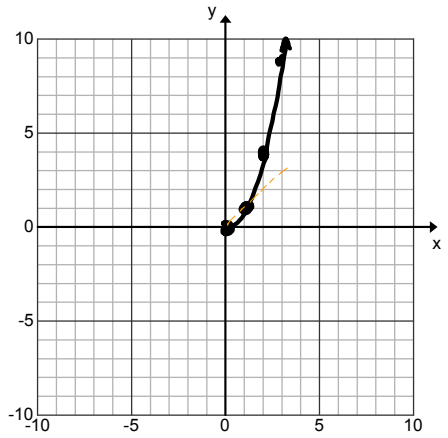
{x| 0≤x≤10, x∈ℝ}

{y| 5≤y≤10, y∈ℝ}

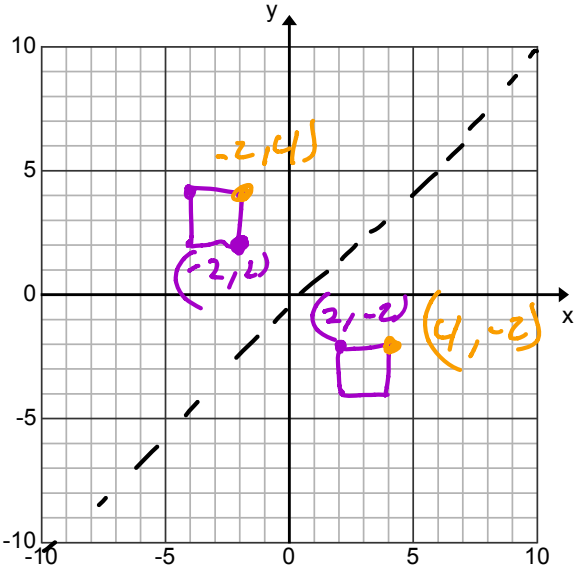
Points on graphs can be reflected as well.

Ex. The point (2, 3) is on the graph of $y=f(x)$ then what point must be on the graph of $y=f(-x)$? (-2, 3)

Reflecting over the line **y=x (AKA INVERSE) (AKA** $y = f^{-1}(x)$ **or** $x = f(y)$**)**

$y = \sqrt{x}$	$x = \sqrt{y}$
	
All points mapped across $y=x$	

This also works for general functions (f(x), g(x), k(x)…). For example, given the graph of $y = f(x)$ sketch a graph of $x = f(y)$ or $y = f^{-1}(x)$



Points on graphs can be reflected as well.
Ex. The point (2, 3) is on the graph of $y = f(x)$ then what point must be on the graph of $x = f(y)$? (3, 2)