

By definition a Relation is a set of ordered pairs
(a bunch of points)

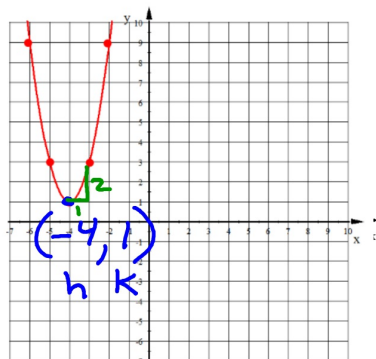
What is a function?

A relation such that every x-value is paired with one and only one y-value.

Not all relations are functions but, all functions are relations.

SEC 7-7 Exploration

1. Plot the following points and connect them to form a parabola.
 $(-6, 9), (-5, 3), (-4, 1), (-3, 3), (-2, 9)$



2. Write the equation of this parabola.

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

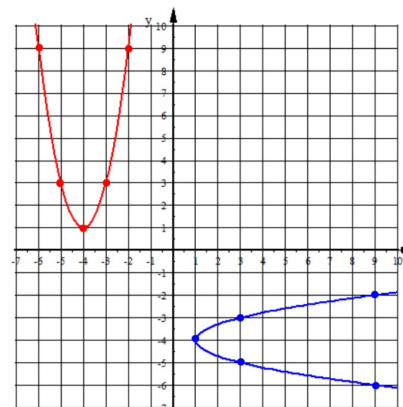
$$y = 2(x+4)^2 + 1$$

This function Parent function



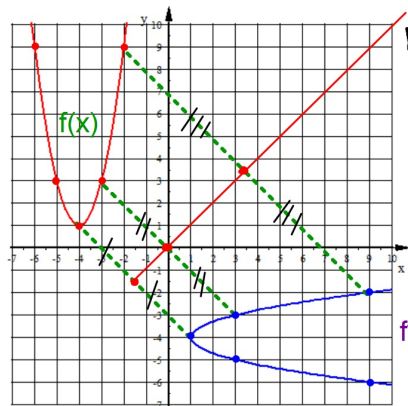
This graph is twice
as tall as the original $a=2$

3. Take each ordered pair and switch the position of each number then plot this point on the same graph that you used for the parabola. Do this with all five points and connect them with a smooth curve. Example: $(-6, 9)$ becomes $(9, -6)$



4. You have just created the **inverse relation** of $f(x)$. The inverse is denoted by the symbol $f^{-1}(x)$. The graph of $f^{-1}(x)$ is actually a reflection of $f(x)$ over a line. What is this line of reflection?

(Remember, a Line of Reflection is the line that is equidistant from corresponding points on $f(x)$ and $f^{-1}(x)$. i.e. it's exactly in the middle of the two graphs)



Line of reflection:

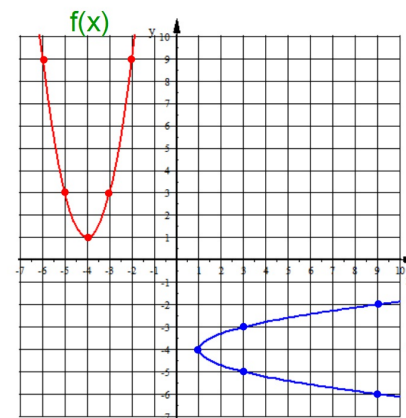
$$m = 1$$

$$b = 0$$

$$y = x$$

This makes sense. Since the point $(-4, 1)$ became $(1, -4)$ the original x-coord ends up as the new y-coord and the original y-coord ends as the new x-coord, $X=Y$ and $Y=X$

to find the Line of Reflection, you can connect corresponding points on the original and image. The Line of reflection is found by connecting the midpoints of these segments.



Domain of $f(x)$

$$(-\infty, \infty)$$

Range of $f(x)$

$$[1, \infty)$$

Domain of $f^{-1}(x)$

$$[1, \infty)$$

Range of $f^{-1}(x)$

$$(-\infty, \infty)$$

The domain of the original becomes the range of the inverse and the range of the original becomes the domain of the inverse.

This continues the theme that $X=Y$.

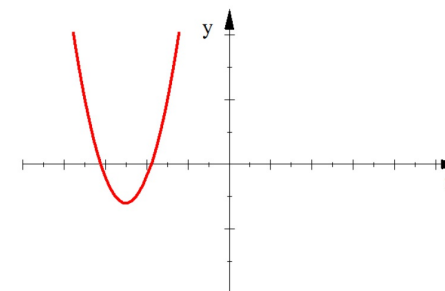
The concept of an Inverse Relation is all about...

switching X and Y

Graphing an inverse using the graphing calculator.

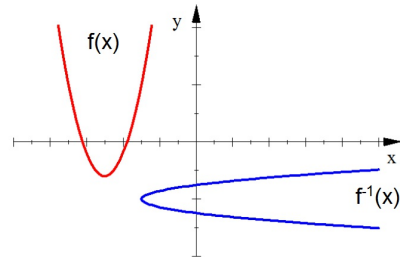
Graph the following in a Standard Window.

$$Y_1 = 2(x + 5)^2 - 3$$



To draw the inverse relation of Y_1 :

1. Press 2nd
2. Press PRGM (DRAW)
3. Choose option 8: DrawInv
4. Press ALPHA then TRACE
5. Choose Y_1
6. Press ENTER



Is the inverse relation to

$$Y_1 = 2(x + 5)^2 - 3$$

a function?

No, $f^{-1}(x)$ doesn't pass
the Vertical Line Test.

