

Algebra 2

6.1 Inverses of Relations and Functions

Objectives:

- Find and graph inverses of relations and functions.
- Determine if an inverse is functions.

To graph an inverse relation or function, switch the x- and y-values and solve for y, then graph.

The graph of the inverse will be a reflection of the relation or function across the line $y = x$.

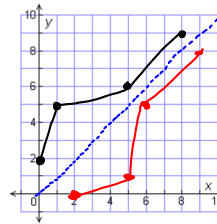
NOTE: Since the x and y values are switched, the domain of the relation or function will be the range of its inverse and vice versa.

Ex. 1:

a.) Graph the relation and connect the points. Then graph the inverse.

f	x	0	1	5	8
	y	2	5	6	9

Inverse: f^{-1}	x	2	5	6	9
	y	0	1	5	8



b.) Identify the domain and range of the relation and of the inverse

D ~~{0, 1, 5, 8}~~ $D [2, 9]$
 R $[0, 8]$ $R [0, 8]$
 R $[2, 9]$

Functions that "undo" each other are inverse functions.

- When the relation is also a function, you can write the inverse of the function, $f(x)$ as $f^{-1}(x)$.

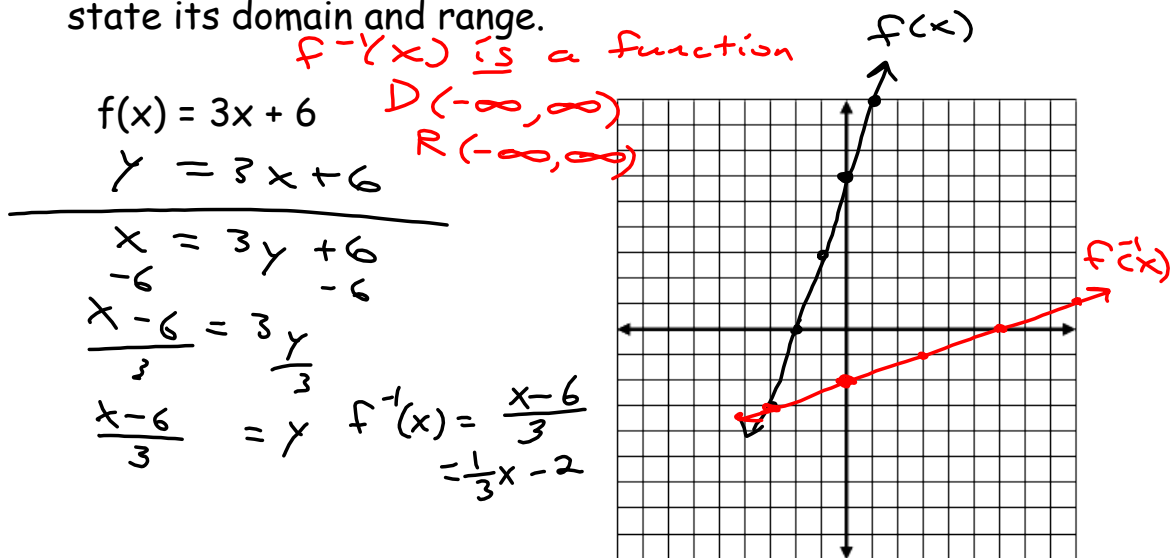
(This notation does not indicate a reciprocal.)

You can use the graph of a function f to determine whether the inverse of f is a function by applying the horizontal line test.

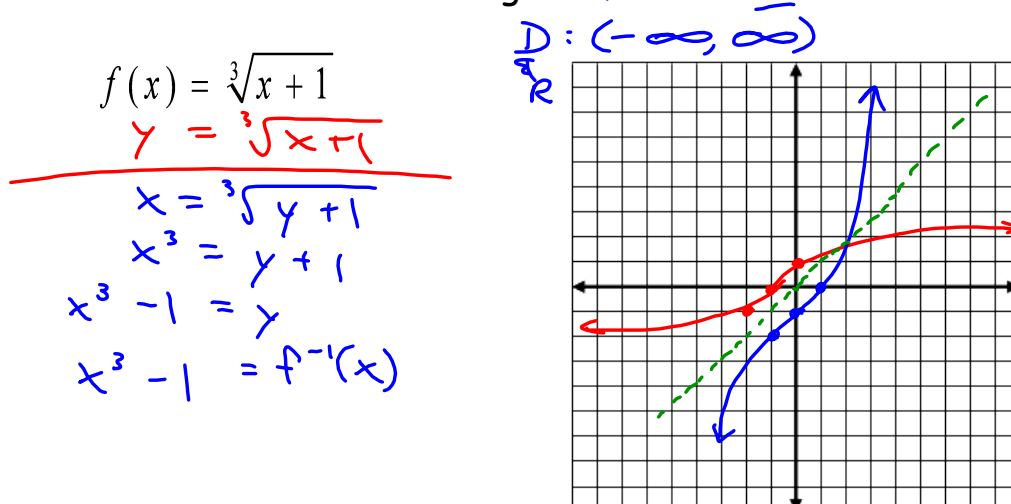
Horizontal-line Test			
WORDS	EXAMPLES		
If any horizontal line passes through more than one point on the graph of a relation, the inverse relation is not a function.	<table border="1"> <tr> <td style="text-align: center;"> <p>Inverse is a function.</p> </td> <td style="text-align: center;"> <p>Inverse is not a function.</p> </td> </tr> </table>	<p>Inverse is a function.</p>	<p>Inverse is not a function.</p>
<p>Inverse is a function.</p>	<p>Inverse is not a function.</p>		

Recall: To find the inverse function, switch x and y then solve for y .
(Replace $f(x)$ with y in the original equation.)

Ex. 2: Find the inverse of the function. Graph the function and its inverse. Determine whether the inverse is a function, and state its domain and range.



Ex. 3: Find the inverse of the function. Graph the function and its inverse. Determine whether the inverse is a function, and state its domain and range.



Ex. 4: Find the inverse of the function. Graph the function and its inverse. Determine whether the inverse is a function, and state its domain and range.

$$f(x) = x^2 - 4$$

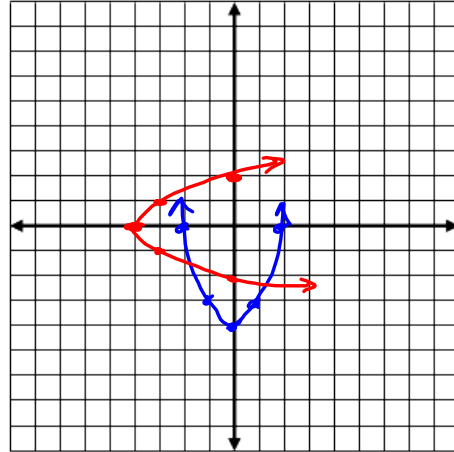
$$y = x^2 - 4$$

$$x = y^2 - 4$$

$$x + 4 = y^2$$

$$\pm\sqrt{x+4} = y$$

not a function
 $D: [-4, \infty)$
 $R: (-\infty, \infty)$



Ex. 5: Find the inverse of the function. Graph the function and its inverse. Determine whether the inverse is a function, and state its domain and range.

$$f(x) = \sqrt{x-3}, \text{ for } x \geq 3$$

$$y = \sqrt{x-3}$$

$$x = \sqrt{y-3}$$

$$x^2 = y - 3$$

$$x^2 + 3 = y$$

$$x^2 + 3 = f^{-1}(x)$$

is a function
 $D: (-\infty, \infty)$
 $R: [3, \infty)$

