

Objective: Find the inverse of a function

Concept

**Relation:** any set of ordered pairs; or, anything that can be written as a set of ordered pairs, both finite and infinite

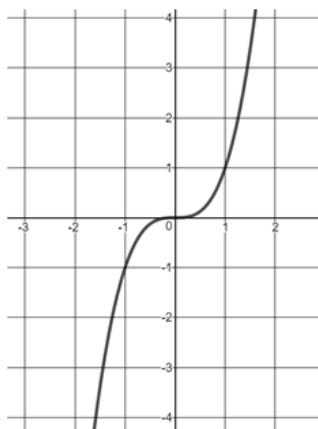
Examples of Relations

$\{(-2,6), (3, -4), (5,0), (7,8)\}$

x	y
-8	18
7	-5
0	-1

$$f(x) = 3x + 7$$

$$g(x) = 6x^2 - 7x + 3$$



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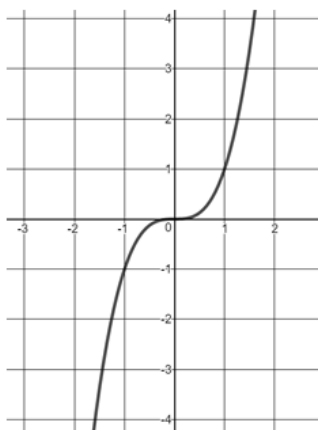
Concept

**Function:** any relation where there is a one-to-one relationship between x-coordinates and corresponding y-coordinates; a function is a relation in which each value of the domain is paired with exactly one value of the range

Examples of Functions

{(-2,6), (3, -4), (5,0), (7,8)}

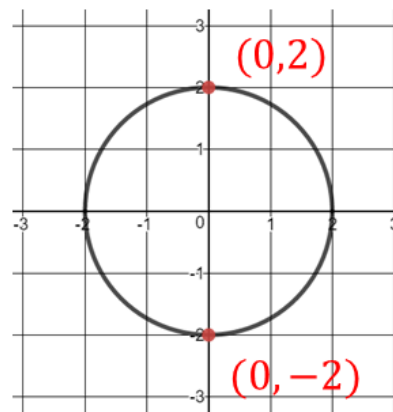
$$y = 3x + 7$$



Examples of Relations that are NOT functions

{(-2,6), (3, -4), (-2,0), (7,8)}

$$y = \pm\sqrt{x + 3}$$



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Concept

The **inverse of a function or relation** is the set of ordered pairs  $(b, a)$  obtained by interchanging (switching) the coordinates of each point  $(a, b)$  in the original relation or function.

For inverse functions, if  $f(x)$  is the original function, then  $f^{-1}(x)$  is the inverse function.  $f^{-1}(x)$  is read "the inverse of  $f(x)$ " or " $f$  inverse of  $x$ ".

Objective: Find the inverse of a function

- Ex) a) Find the inverse of  $\{(-5,2), (-3,-9), (7,2), (0,8)\}$ .  
b) Is the inverse also a function? Explain.

Skill

To find the inverse of a finite set of ordered pairs, interchange (switch) the x and y coordinates in all ordered pairs.

a) inverse:  $\{(2,-5), (-9,-3), (2,7), (8,0)\}$

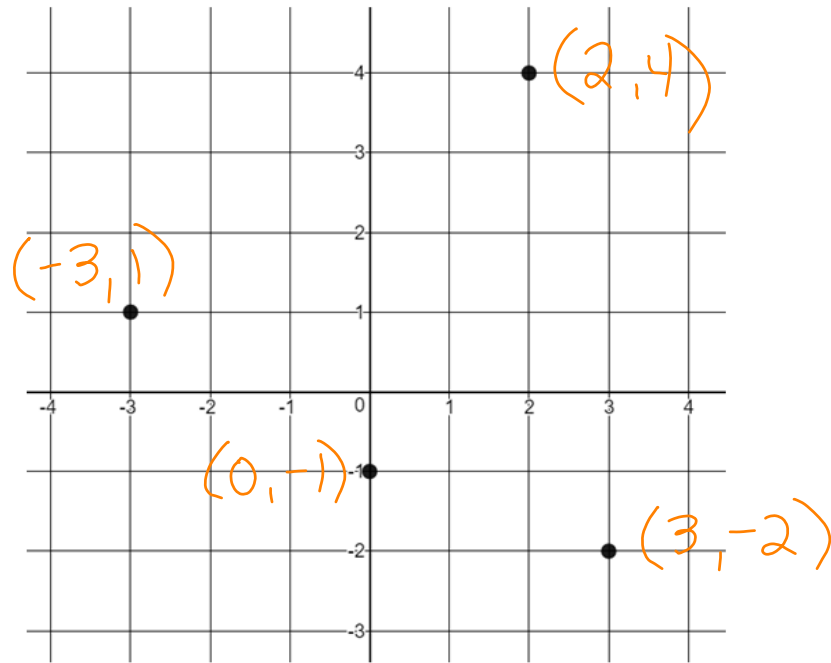
b) The inverse is not a function because the x value of 2 is paired with two y values, -5 and 7.

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- Ex) a) Find the inverse of the function shown in the graph.  
 b) Is the inverse also a function? Explain.

Strategy:

1. Write the ordered pairs of the given function.
2. Find the inverse by interchanging (switching) the coordinates of all points.



②  
 a) inverse  
 $\{(1, -3), (-1, 0), (4, 2), (-2, 3)\}$

b) The inverse is a function because each x value is paired with exactly one y value.



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- Ex) a) Find the inverse of the function shown in the table.  
b) Is the inverse also a function? Explain.

x	y
7	6
3	1
-3	2
4	1

a)  $\{(6, 7), (1, 3), (2, -3), (1, 4)\}$

b) The inverse is not a function because the x value of 1 is paired with two y values, 3 and 4.

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Because  $x$  and  $y$  coordinates are interchanged to create the inverse of a function, the domain of the function becomes the range of the inverse and the range of the function becomes the domain of the inverse.

- Ex) a) What are the domain and range of the function?  
b) What are the domain and range of the inverse?

$\{(-5,2), (-3,-9), (7,2), (0,8)\}$

a) function  
Domain:  $\{-5, -3, 0, 7\}$   
Range:  $\{-9, 2, 8\}$

b) inverse  
Domain:  $\{-9, 2, 8\}$   
Range:  $\{-5, -3, 0, 7\}$

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Ex) If  $f(2) = 5$  and  $f(-3) = -12$ , find the following.

a)  $f^{-1}(-12) = \underline{-3}$       b)  $f^{-1}(5) = \underline{2}$

"inverse of f"



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Closure

Explain how to find the inverse of a function.

To find the inverse of a function you interchange, or switch, the x and y coordinates in every point.

