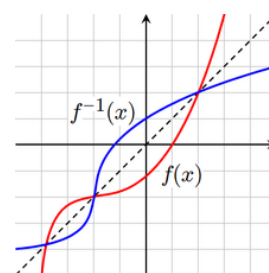
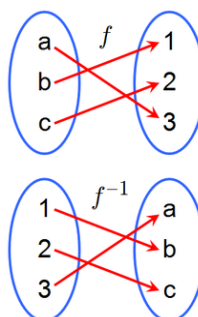


1.05 - Inverse Functions



Learning Goals

- I know how to find the equation and graph of an inverse relation, and I can state its properties.
- I know under what conditions the inverse relation is a function.



Simply stated, an **inverse** is something that is the opposite or reverse of something else. For example, the inverse of the operation addition is subtraction and vice versa. When a mathematical operation does something with terms, its inverse operation undoes it.


Do


Undo

The idea of an inverse applies to relations too! If the relation is a function, a function accepts one input and produces one output. The **inverse function** accepts that output (as an input) and produces one output (the original function's input!).



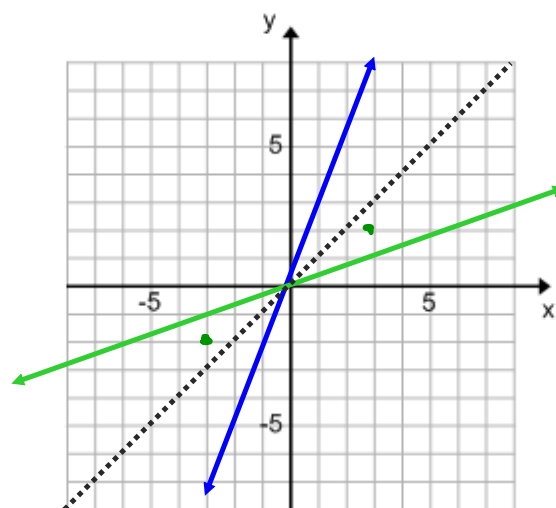
Note: *not all inverse relations are functions!*

Example 1:

- a) Using a table of values, graph $f(x) = 3x$
 b) Using a table of values, graph its inverse relation.
 c) State the equation of the inverse relation.

x	f(x)
-2	-6
-1	-3
0	0
1	3
2	6

x	$f^{-1}(x)$
-6	-2
-3	-1
0	0
3	1
6	2



$$f(x) = 3x$$

$$f^{-1}(x) = \frac{1}{3}x$$

$$x = 3y$$

$$\frac{1}{3}x = y$$

Example 2:

- a) Determine the equation of the inverse relation of $y = (x + 2)^2 - 3$
 b) Without graphing, is the inverse relation a function? Explain.

$$\begin{aligned} \text{a) } x &= (y+2)^2 - 3 \\ x+3 &= (y+2)^2 \\ \sqrt{x+3} &= y+2 \\ \pm\sqrt{x+3} - 2 &= y \end{aligned}$$

b) This is a parabola on its side!
 \therefore each x could have 2 possible values
 \therefore NOT a function

Example 3:

Given:

$$h(x) = 2x^3$$

Find:

$$h^{-1}(-8)$$

$$x = 2y^3$$

$$\frac{x}{2} = y^3$$

$$\sqrt[3]{\frac{x}{2}} = y$$

$$h^{-1}(x) = \sqrt[3]{\frac{x}{2}}$$

$$\begin{aligned} h^{-1}(x) &= \sqrt[3]{\frac{-8}{2}} \\ &= \sqrt[3]{-4} \end{aligned}$$

All properties of the independent variable in a relation correspond to the properties of the dependent variable in its inverse, and vice versa.

Practice:

pg 43 #1cd, 2d, 3, 4**, 6d, 10e, 12c, 13ab, 14, 16.

To start #4, create a table of values for $y = x^3$ then graph it.

**Optional Quizzes**

- <http://courseware.cemc.uwaterloo.ca/8/assignments/113/4>
- <http://courseware.cemc.uwaterloo.ca/8/assignments/113/5>
- <http://courseware.cemc.uwaterloo.ca/8/assignments/113/6>
- <http://courseware.cemc.uwaterloo.ca/8/assignments/113/7>