6-7: Inverse Relations and Functions

Algebra 2
Mr. Gallo

Inverse of a Relation

- Relation pairs an element from its domain with its range (a, b)
- Inverse relation "reverses or undoes" relation and pairs (b, a)

x	y
-2	2
-1	0
0	3
1	0

Relation

x	y
2	-2
0	-1
3	0
0	1

Inverse Relation

Equations of Inverse Relations

- Switch x and y and solve for y.

$$y = 5x^2 + 2$$

$$x = 5y^2 + 2$$

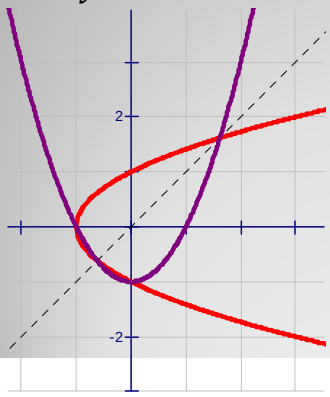
$$x - 2 = 5y^2$$

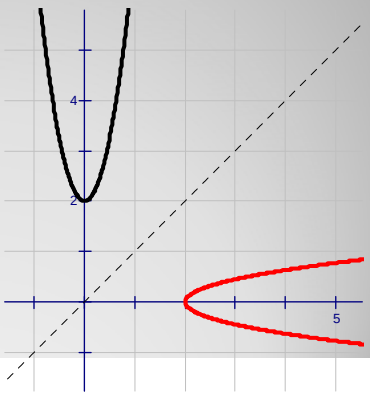
$$\frac{x-2}{5} = y^2$$

$$\pm\sqrt{\frac{x-2}{5}} = y$$

Graphs of Inverse Relations

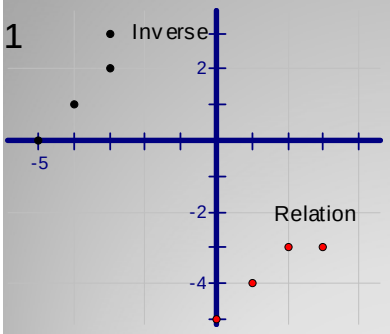
- Found by switching the x and y coordinates
- Reflections of each other over the equation $x = y$.



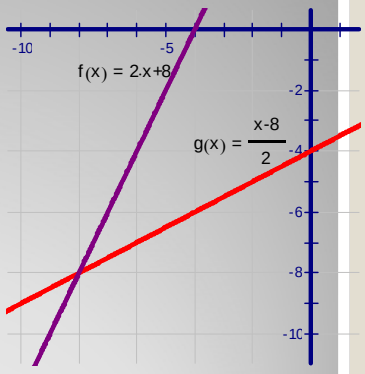


Answers to Got It #1-3

#1



#3



#2 $y = \frac{x-8}{2}$

Finding an Inverse Function

Consider the function $g(x) = -\frac{2}{3}x + 7$.

a. What is the domain and range of f?
b. What is g^{-1}?
c. What are the domain and range of g^{-1}?
d. Is g^{-1} a function?

a. The domain and range are both all real numbers.

b. $y = -\frac{2}{3}x + 7$

$x = -\frac{2}{3}y + 7$

$x - 7 = -\frac{2}{3}y$

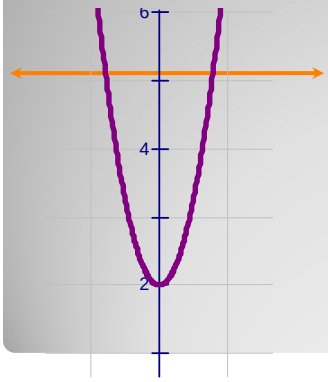
$-\frac{3x+21}{2} = y$

c. The domain and range are both all real numbers.

d. Yes, for each x in the domain, there is only one value for y in the range.

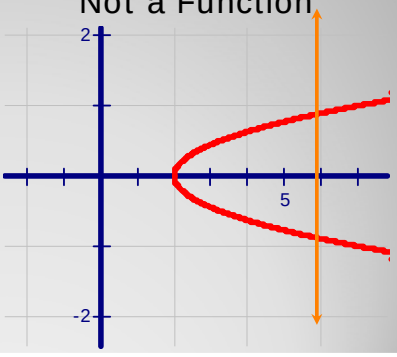
Graphs of Functions

- If the graph of a function passes the *Horizontal Line Test*, the **inverse** is also a function.



Function

Not a Function



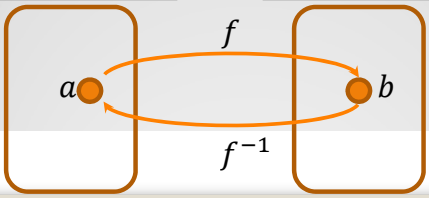
Inverse

One to One Functions

- Each member of the *domain* corresponds to one member in the **range**.
- Each member of the *range* corresponds to one member in the **domain**.
- Has an inverse which is a function.
- f maps a to b, and f^{-1} maps b to a.

Domain of f
Range of f^{-1}

Range of f
Domain of f^{-1}



Composition of Inverse Functions

If f and f^{-1} are inverse functions, then

$(f^{-1} \circ f)(x) = x$ and $(f \circ f^{-1})(x) = x$ for x in the domains of f and f^{-1}, respectively.

Let $f(x) = -2x - 3$. What is each of the following?

a). $f^{-1}(x)$

$$x = -2y - 3$$
$$x + 3 = -2y$$
$$\frac{x+3}{-2} = y$$

b). $(f \circ f^{-1})(x)$

$$= -2\left(\frac{x+3}{-2}\right) - 3$$
$$= x + 3 - 3$$
$$= x$$

c). $(f^{-1} \circ f)(x)$

$$= \frac{(-2x-3)+3}{-2}$$
$$= \frac{-2x}{-2}$$
$$= x$$

Proves whether a function is an inverse of another function.

Homework: p. 410 #13-19 odd, 31-35 odd, 38-41, 79-91 odd