Perform the indicated operation.

1) $f(x) = 2x - 1$
$g(x) = x^2 + 3$
Find $f(g(x))$
$2x^2 + 5$

2) $g(n) = n + 2$
$h(n) = n^3 + 2n$
Find $g(h(n))$
$n^3 + 2n + 2$

3) $f(x) = x^2 + 4$
$g(x) = 4x + 5$
Find $f(g(x))$
$16x^2 + 40x + 29$

$(4x+5)^2 + 4$
$(4x+5)(4x+5)$
$16x^2 + 40x + 25 + 4$

4) $f(t) = -3t + 3$
$g(t) = t^2 - 4$
Find $f(g(t))$
$-3t^2 + 15$

6.4

Notes: Inverse Functions

Notes! Inverse Functions

Original Function | Inverse Function

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

$g(x) =$ $g^{-1}(x)$

Notes! Inverse Functions

Four Representations: Tables--

Original Function

x	f(x)
5	6
3	8
1	10
-1	12
-3	14
-5	16
-7	18

Inverse Function

x	$f^{-1}(x)$
6	5
8	3
10	1
12	-1
14	-3
16	-5
18	-7

Switch the x and y in the table

1. $f(x) = 3x + 5$

Numerically (table)

a. Make a table of values for $f(x)$

x	-2	-1	0	1	2
$f(x)$	-1	2	5	8	11

b. Make a table of values for $f^{-1}(x)$

x	-1	2	5	8	11
$f^{-1}(x)$	-2	-1	0	1	2

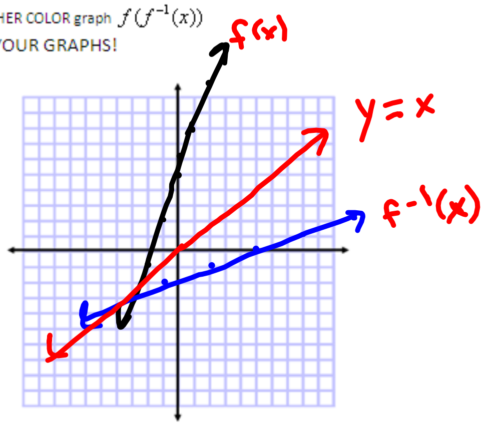
Graphically (Graph)

In BLACK graph $f(x)$

In BLUE graph $f^{-1}(x)$

In ANOTHER COLOR graph $f(f^{-1}(x))$

LABEL YOUR GRAPHS!



Analytically (Equation)

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

$y = 3x + 5$

$x = 3y + 5$

$-5 \quad -5$

$\frac{x-5}{3} = \frac{3y}{3}$

$f^{-1}(x) = \frac{x-5}{3}$

b. Show that $f(f^{-1}(x)) = x$

$3\left(\frac{x-5}{3}\right) + 5$

$x - 5 + 5 = x$

c. Show that $f^{-1}(f(x)) = x$

$\frac{3x+5-5}{3} = \frac{3x}{3} = x$

Verbally (Words)

a. Explain how you know from the graph that $f(x)$ and $f^{-1}(x)$ are inverses.

They reflect about the line symmetry of y=x.

b. Explain how you know from the algebra that $f(x)$ and $f^{-1}(x)$ are inverses.

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

c. Explain how you know from the tables that $f(x)$ and $f^{-1}(x)$ are inverses.

Switch the x and y in the table

Notes!

Inverse Functions

Four Representations: Equations--

Replace f(x) with y

Switch the x and y and solve for y

Original Function

$f(x) = 2x + 3$

$y = 2x + 3$

$x = 2y + 3$
$-3 \quad\quad -3$

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

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

Inverse Function

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

Notes!

Inverse Functions

Try it on your own:

Original Function

$$f(x) = 5x + 6$$

$y = 5x + 6$

$x = 5y + 6$

$-6 \quad -6$

$\frac{x-6}{5} = \frac{5y}{5}$

Inverse Function

$$f^{-1}(x) = \frac{x-6}{5}$$

Notes! Inverse Functions

Try it on your own:

Original Function | Inverse Function

$$f(x) = \frac{3x-1}{2}$$

$$y = \frac{3x-1}{2}$$

$$2x = \frac{3y-1}{2}\,2$$

$$2x = 3y - 1$$

$$\frac{2x+1}{3} = \frac{3y}{3}$$

$$\frac{2}{3}x + \frac{1}{3}$$

$$f^{-1}(x) = \frac{2x+1}{3} \text{ or } \frac{2}{3}x + \frac{1}{3}$$

Notes!

Inverse Functions

Verify that the two functions are inverses of one another.

Do the composite of your original and your inverse. If both are equal to x then they are inverses. $f\left(f^{-1}(x)\right) = x$ $f^{-1}\left(f(x)\right) = x$

$f(x) = 4x + 2$

$4\left(\frac{1}{4}x - \frac{1}{2}\right) + 2$

$x - 2 + 2$

x

$f^{-1}(x) = \frac{1}{4}x - \frac{1}{2}$

$\frac{1}{4}(4x+2) - \frac{1}{2}$

$x + \frac{1}{2} - \frac{1}{2}$

x

Inverse Functions

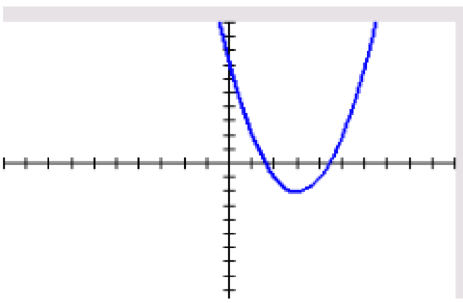
Functions f and g are inverses of each other provided:

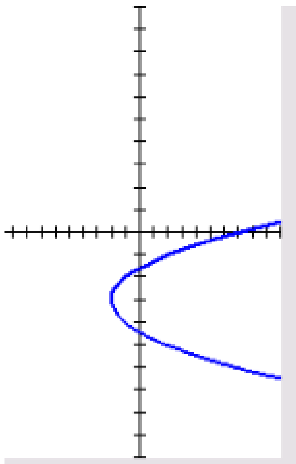
$f(g(x)) = x$ and $g(f(x)) = x$

The function g is denoted by f^{-1}, read as "f inverse".

Given any function, you can always find its inverse relation by switching x and y. Then solve for y.

Recall: How can you tell whether a relation is a function?





One-to-One

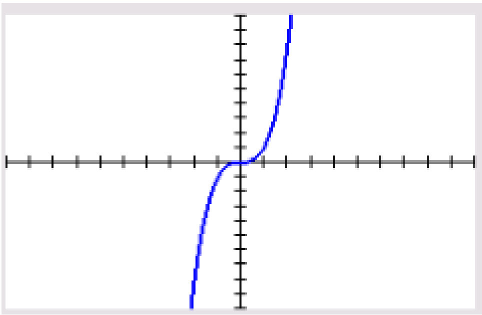
Both the original and the inverse are functions.

Vertical line test

If a vertical line intersects the graph of a function f more than once, then the inverse of f is itself a function.

Horizontal line test

If a horizontal line intersects the graph of a function f more than once, then the inverse of f is itself a function.

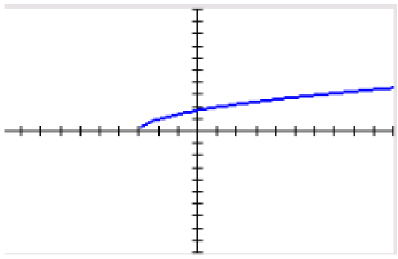


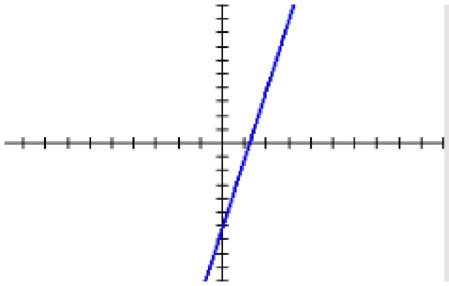
Vertical line Test

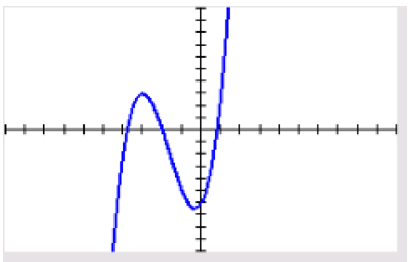
Horizonal line test

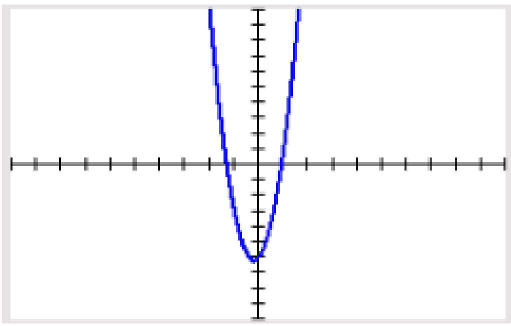
If both horizontal and veritcal line tests hold true, then it is one-to-one.

Is it a one-to-one function?









Inverse Functions

Verify that the two functions are inverses of one another.

Now you try...

$$f(x) = 3x - 5 \qquad f^{-1}(x) = \frac{1}{3}x + \frac{5}{3}$$

Notes! Graphing Inverse Functions

Four Representations: Graphing--

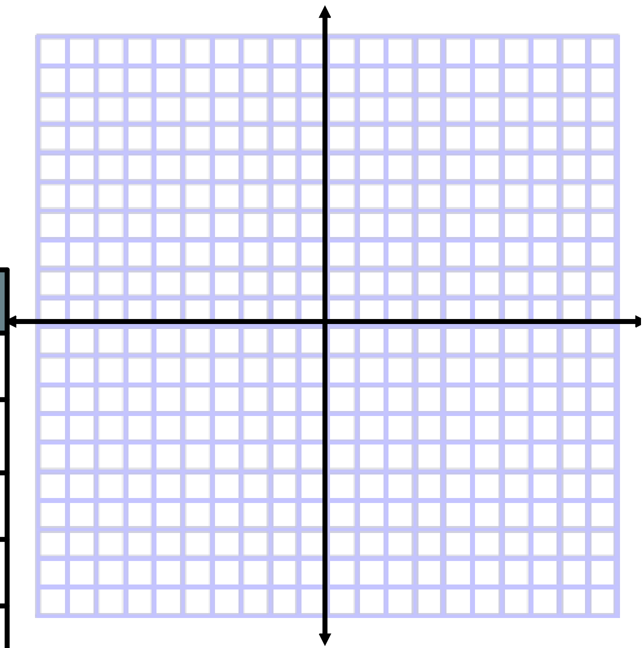
Steps to graphing an inverse function:

1. Find the inverse function
2. Create a table
3. Evaluate the range
4. Plot inverse points
5. Verify using the y=x reflection line.

$$y = \frac{1}{4}x - 3$$

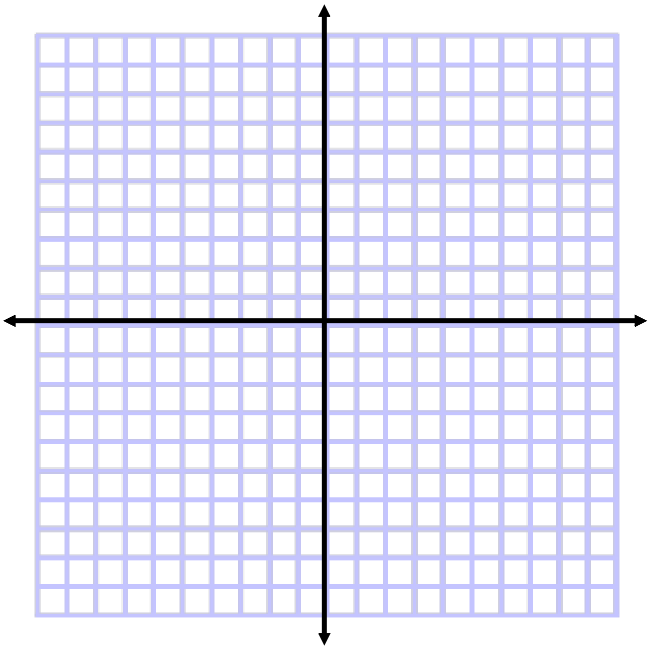
X	Y

X	Y



$$y = \frac{1}{2}x + 4$$

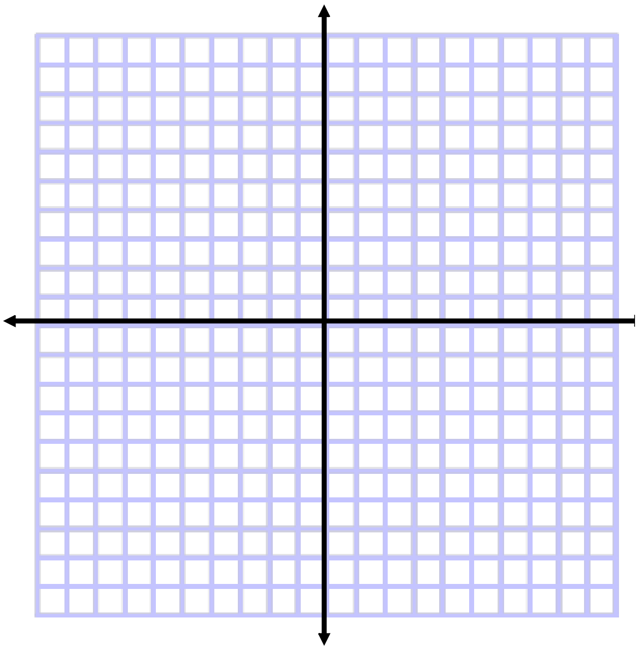
X	Y



What about this...

$$y = (x - 2)^2$$

X	Y



4 representations (Inverses) WS #5.pdf

Attachments

4 representations (Inverses) WS #5.pdf