Warm up

1. Find the equation of the line perpendicular to 2x - 3y = 7 through the point (4, -2).

$y+2=-\frac{3}{2}(x-4)$

$y+2=-3/2x+6$

$y=\frac{-3}{2}x+4$

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

2. Factor $10x^2 + 3x - 4$

$10x^2+8x-5x-4$

$2x(5x+4)-1(5x+4)$

$(5x+4)(2x-1)$

3. For $f(x)=-(x+2)^2$ and $g(x)=4x-1$
   a. find f(2) $-(4)^2=-16$
   b. f + g (x) $-x^2-4x-4+4x-1=-x^2-5$
   c. $f \circ g$ (x)
   d. domain of $g \circ f$ (x)

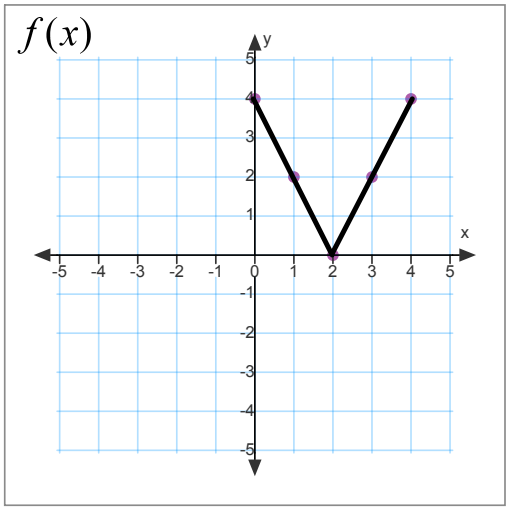
4. Write down what you think of when you hear the word inverse.

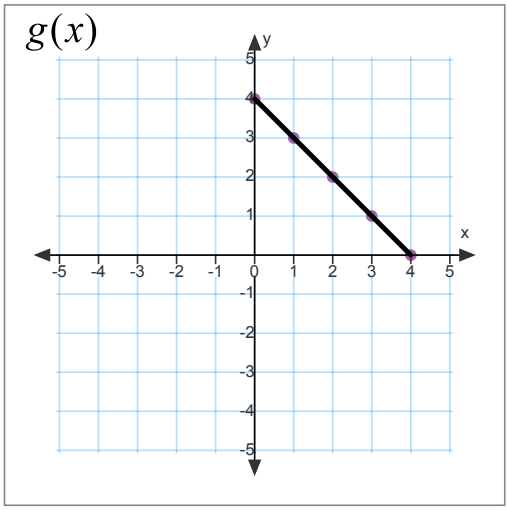
$-((4x-1)+2)^2$

$-(4x+1)^2=-16x^2-8x-1$

$(-\infty,\infty)$

HOMEWORK QUESTIONS



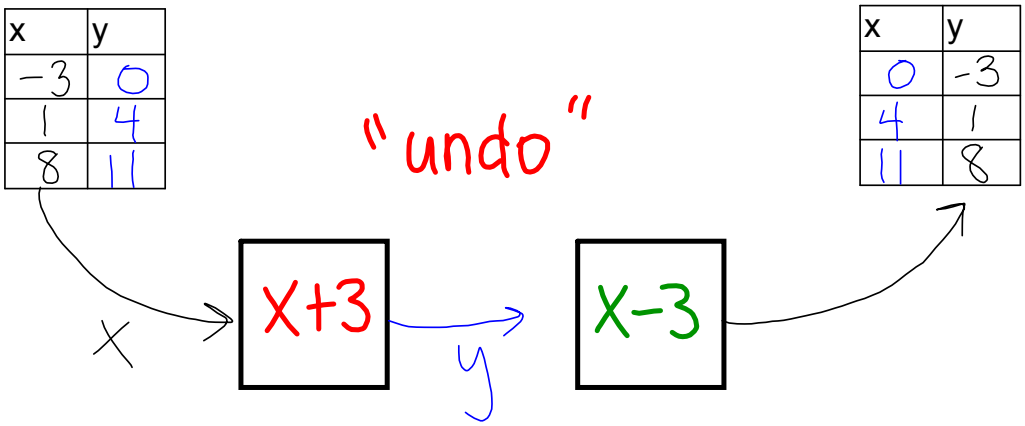


1.6 Inverse Functions

finding inverse functions algebraically

verify two functions are inverses

Let's look at the function f(x)=x + 3.



The inverse of a function is written $f^{-1}(x)$

What is the relationship between the domain and range of a function and the domain and range of its inverse?

$f(x)$

D: $-3, 1, 8$

R: $0, 4, 11$

$f^{-1}(x)$

D: $0, 4, 11$

R: $-3, 1, 8$

Let's look again at the function $f(x)=x + 3$.

We know from before that the "undo function" is $f^{-1}(x)=x - 3$

Here is why...algebraically

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

Show that f(x) and g(x) are inverses of each other algebraically.

Method 1: switch x & y, solve for y

$f(x) = x^2 + 1, \quad x \geq 0$

$y = x^2 + 1$

$x = y^2 + 1$

$x - 1 = y^2$

$\sqrt{x-1} = y$

$g(x) = \sqrt{x-1}$

$y = \sqrt{x-1}$

$x = \sqrt{y-1}$

$x^2 = y - 1$

$x^2 + 1 = y$

Show that f(x) and g(x) are inverses of each other algebraically.

Method 2: composition ($f \circ g$, $g \circ f$)

$f(x) = x^2 + 1, \quad x \geq 0$

$g(x) = \sqrt{x-1}$

$(\sqrt{x-1})^2 + 1$

$x - 1 + 1$

x

$\sqrt{(x^2+1)-1}$

$\sqrt{x^2}$

x

Show that f(x) and g(x) are inverses of each other algebraically.

Your turn!

$f(x) = 7x + 4$

$y = 7x + 4$

$x = 7y + 4$

$x - 4 = 7y$

$\frac{x-4}{7} = y$

$g(x) = \frac{x-4}{7}$

$y = \frac{x-4}{7}$

$x = \frac{y-4}{7}$

$7x = y - 4$

$7x + 4 = y$

Find the inverse relation of the given function. Is the inverse a function? Verify the two relations are inverses of each other.

$f(x) = -4x - 9$

$y = -4x - 9$

$x = -4y - 9$

$x + 9 = -4y$

$\frac{x+9}{-4} = y$

Method 1:

$\frac{y+9}{-4} = x$

$y + 9 = -4x$

$y = -4x - 9$ ✓

Method 2:

$-4\left(\frac{x+9}{-4}\right) - 9$

$x + 9 - 9$

x ✓

Now you try.

$$f(x) = 3x^3 + 1$$

What about $f(x) = 2x^2 - 3$

HOMEWORK

p 69 9, 11 (no part b), 15-17, 59, 61

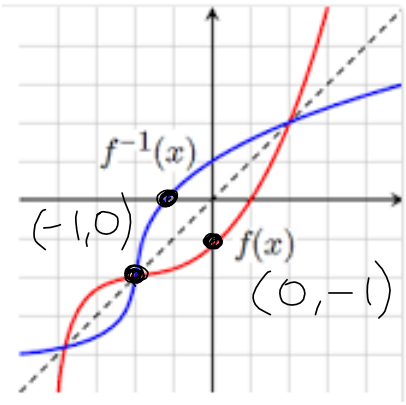
1.6 Inverses Part 2

Determine inverses graphically

Graph an inverse relation

One-to-one functions

Graph of an inverse



f(x) and $f^{-1}(x)$ are inverses if they are symmetrical over the line y = x

f(x)

x	y
-1	6
2	3
4	6

yes!

$f^{-1}(x)$

x	y
6	-1
3	2
6	4

No!

Does every relation have an inverse?

yes!

Is every inverse relation a function?

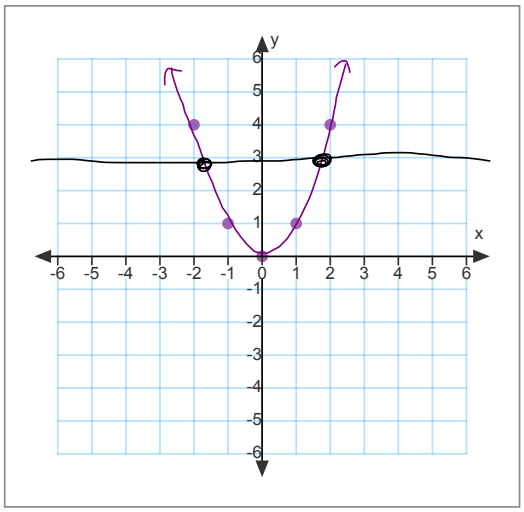
No!

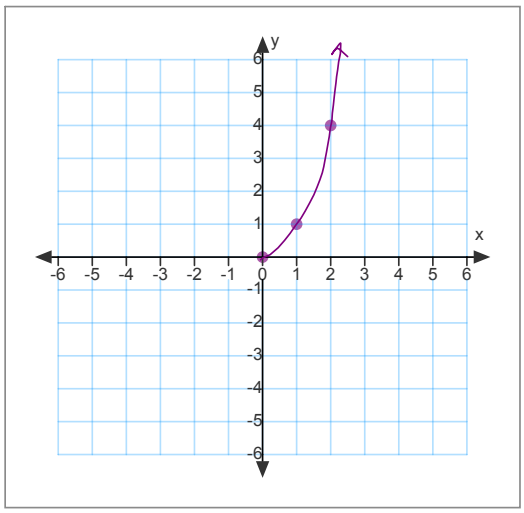
Definition - One-to-one function

A function is said to be one-to-one if its inverse is also a function.

Our last example was not a one-to-one function. Can you make a table of values that would represent a one-to-one function?

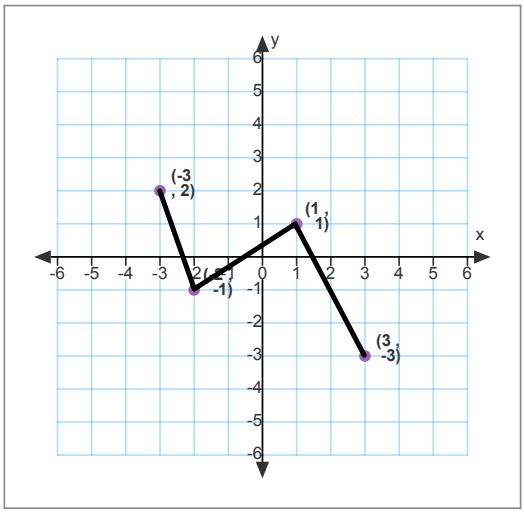
How can we determine if a relation is a one-to-one function by observing its graph?





Horizontal line Test!

Inverses from graphs (WB p 10)



f(x)

X	Y
-3	2
-2	-1
1	1
3	-3

$f^{-1}(x)$

X	Y
2	-3
-1	-2
1	1
-3	3

f(3)= -3

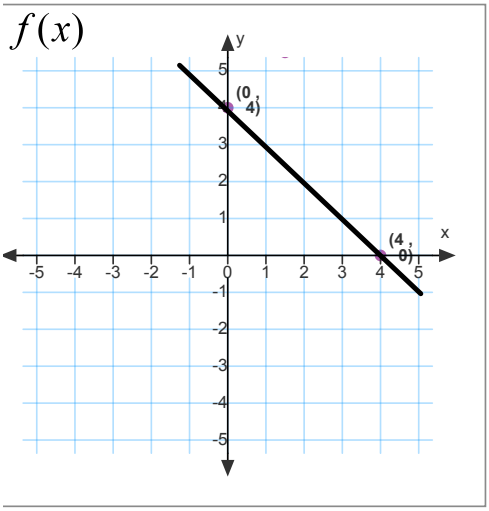
f(-2)= -1

$f^{-1}(-3)$ = 3

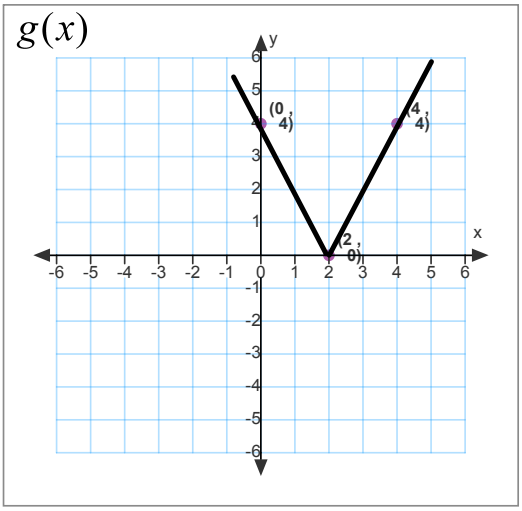
$f^{-1}(2)$ = -3

Inverse operations from graphs (WB p 10)

$f(x)$



$g(x)$



$(f^{-1} + g^{-1})(2)$

$f^{-1}(2) + g^{-1}(2)$

$2 + 1 = 3$

$2 + 3 = 5$

$fg^{-1}(1)$

$f(1) \cdot g^{-1}(1)$

$3 \cdot 1.5 = 4.5$

$3 \cdot 2.5 = 7.5$

$f^{-1} \circ f(4)$

$f^{-1}(f(4))$

$f^{-1}(0)$

$= 4$

$f^{-1} \circ g(3)$

$f^{-1}(g(3))$

$f^{-1}(2)$

$= 2$

HOMEWORK

p 69 21-25, 30, 33-39 odd, 47-51 odd, 67, 80-88 even, 93, 97, 99, 101

17.