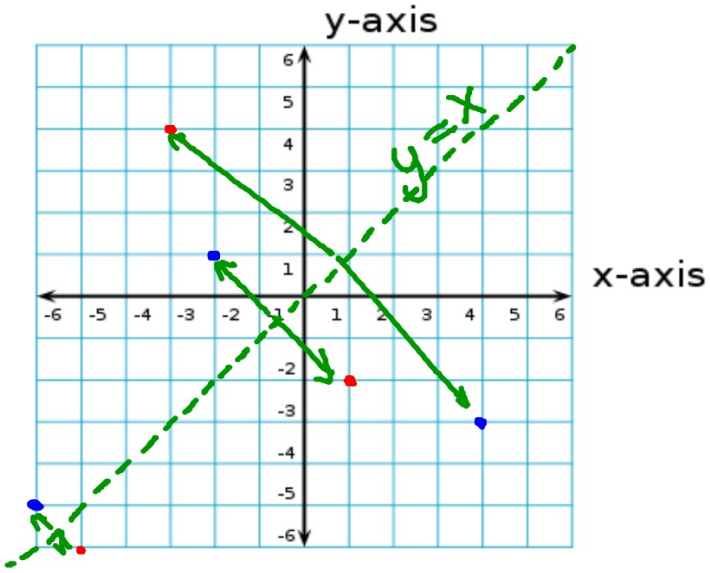
January 2, 2012

Get out your notes

1/2 - Inverse Functions

$\{(-2,1),(4,-3),(-6,-5)\}$ **original function**

$\{(1,-2),(-3,4),(-5,-6)\}$ **inverse function**



Write an equation for the inverse of the relation.

$y = -2x + 4$

$x = -2y + 4$

now solve for y

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

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

$\boxed{y = -\frac{1}{2}x + 2}$

$y = 3x - 5$

$x = 3y - 5$

$+5 \quad +5$

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

$\frac{1}{3}x + \frac{5}{3} = y$

$\boxed{y = \frac{1}{3}x + \frac{5}{3}}$

Sketch the function and its inverse on the same graph. Is the inverse a function of x?

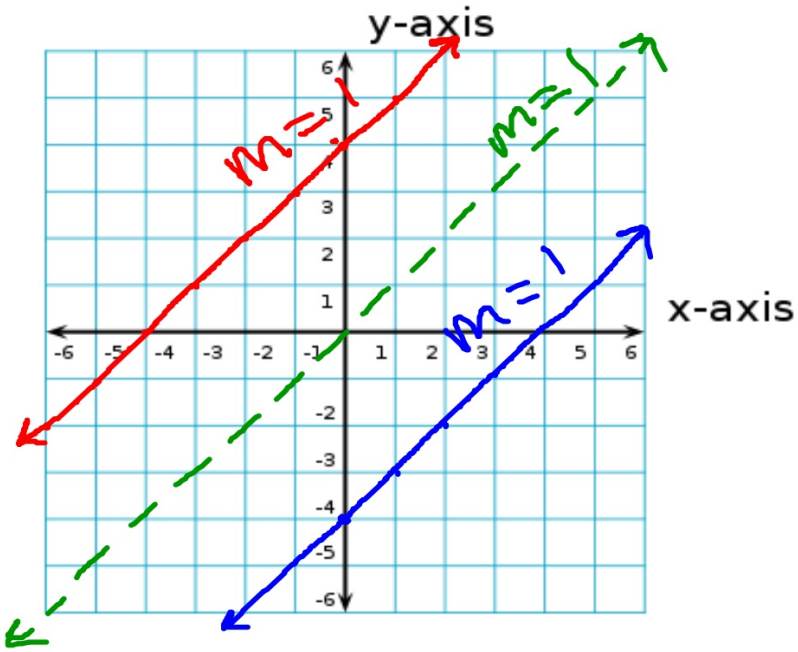
$$f(x) = x + 4$$

$y = x + 4$

$x = y + 4$

$x - 4 = y$

Yes, it's a function.



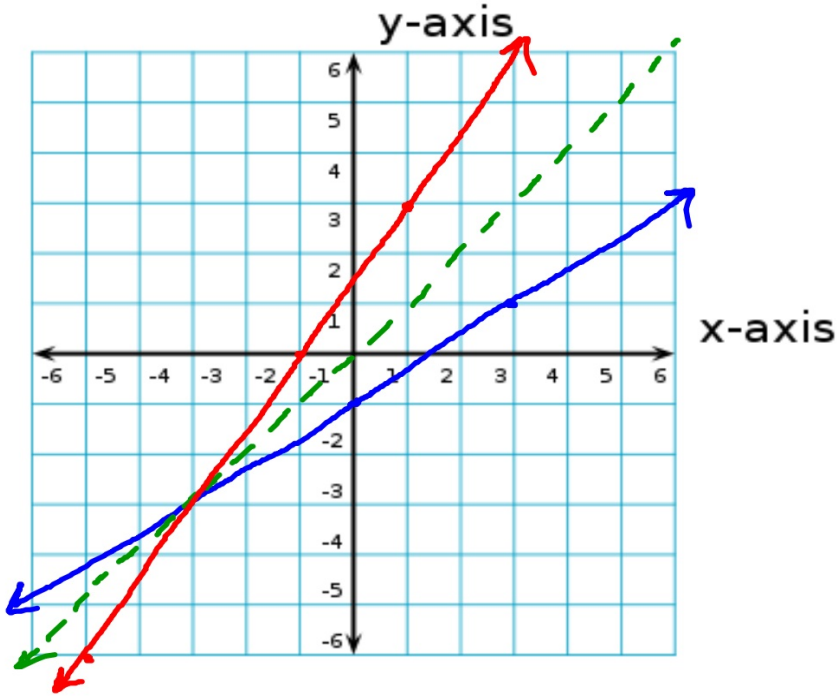
$f(x) = \frac{2}{3}x - 1$

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

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

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

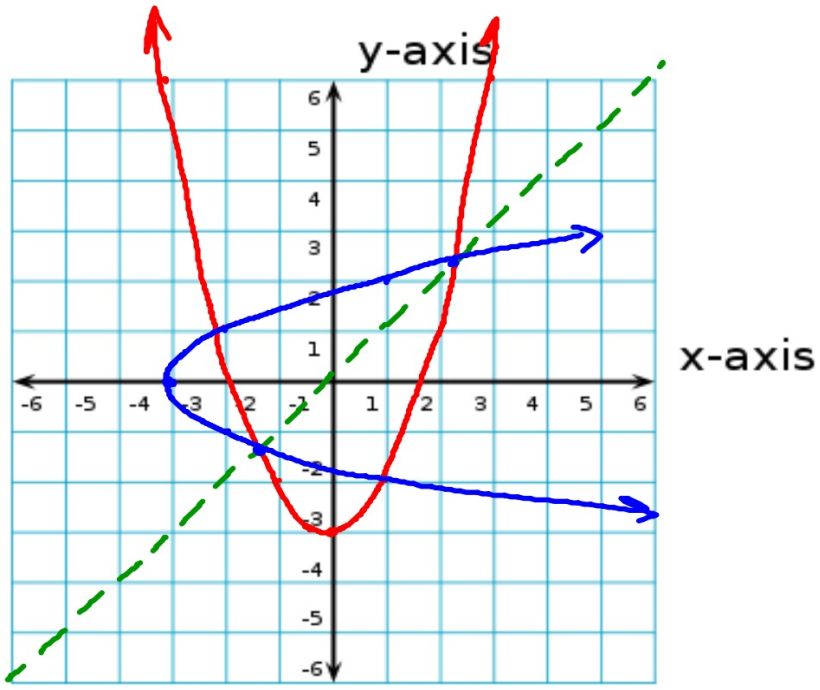
Yes, it's a function.



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

Is the inverse a function?

No!

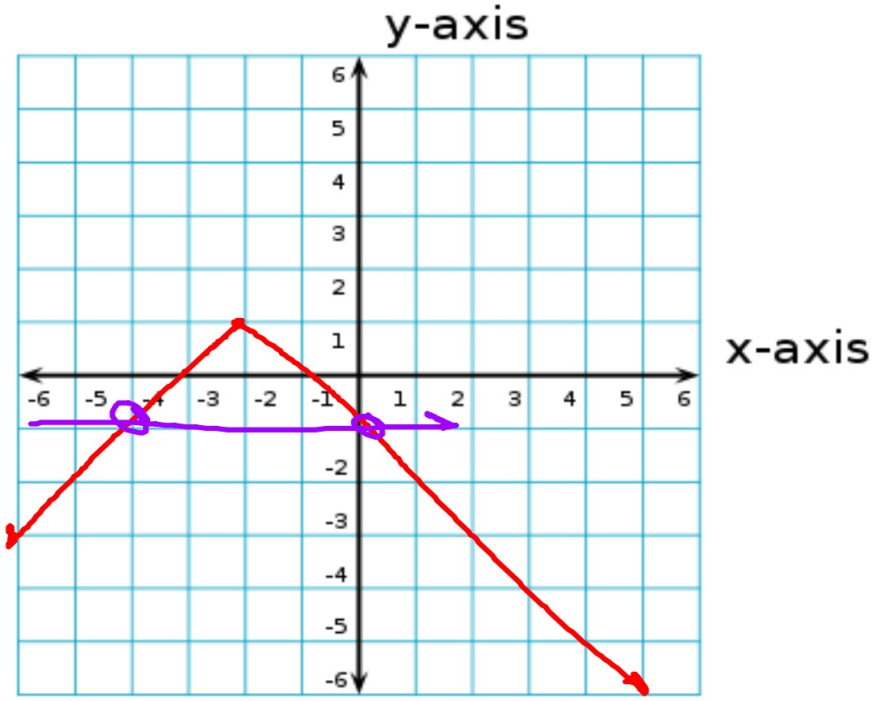


Sketch the graph of the function. Use that graph to tell if the graph of its inverse will be a function.

$$f(x) = |x+2|+1$$

left up
2 1

Inverse is NOT a function — a horizontal line crosses more than once



Verify that the 2 functions are inverses of each other.

Method 1 - Find individual inverses.

$f(x) = 2x - 1$

$y = 2x - 1$

$x = 2y - 1$

$+1 \quad +1$

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

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

$g(x) = \frac{1}{2}x + \frac{1}{2}$

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

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

$2x = y + 1$

$-1 \quad -1$

$2x - 1 = y$

Method 2 - Find both composite functions.

$f(x) = 2x - 1$

$f(g(x))$

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

$= x + 1 - 1$

$y = x$

$g(x) = \frac{1}{2}x + \frac{1}{2}$

$g(f(x)) =$

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

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

$y = x$

HOMEWORK

Page 302 #8-40 even

Due