

BE-Alg 2 | Monday 12-5-11

① Define a function.

② Is $\{(-2, -1), (-1, 1), (0, 3), (1, 5), (2, 7)\}$

A function?

③ Graph: $y = x$

The inverse of a function is found by switching every x and y . It has its own notation, if $y = f(x)$ the inverse of $f(x)$ is $y = f^{-1}(x)$

The inverse of $\{(-2, -1), (-1, 1), (0, 3), (1, 5), (2, 7)\}$ is $\{(-1, -2), (1, -1), (3, 0), (5, 1), (7, 2)\}$

Suppose, instead of 5 ordered pairs, I told you $y = f(x) = 2x + 3$

How do you find $y = f^{-1}(x)$?

Take $y = f(x) = 2x + 3$, swap $x \rightarrow y$

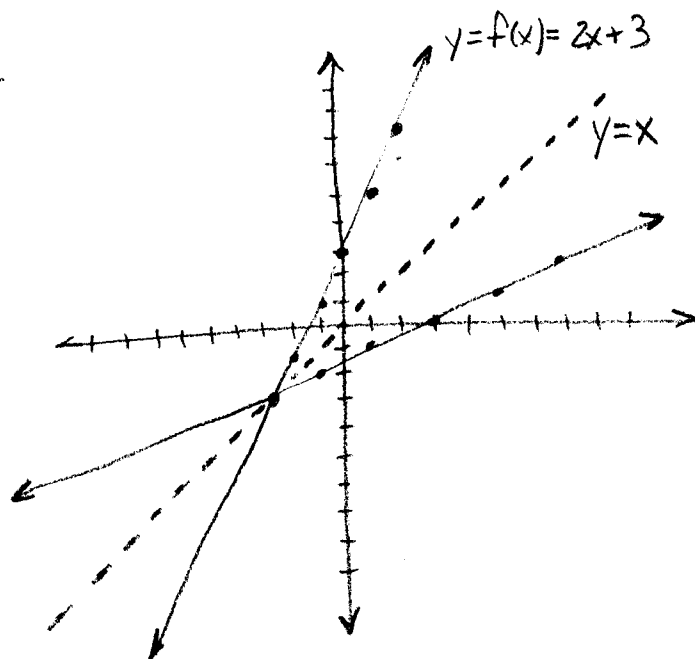
$f^{-1}(x) \Rightarrow x = 2y + 3$, now solve for y

$$x - 3 = 2y$$

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

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

x	$f(x)$	x	$f^{-1}(x)$
-2	-1	-1	-2
-1	1	1	-1
0	3	3	0
1	5	5	1
2	7	7	2



input $\rightarrow$ output $\rightarrow$ input $\rightarrow$ output

-3	-3	-3	-3
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$$y = x$$

$y = 1x + 0$ AXIS OF SYMMETRY

The inverse of a relation may or may not be a function. For a function to have an inverse function, they must be symmetrical across the line $y=x$.

Algebraically $(f \circ g)(x) = x$
and $(g \circ f)(x) = x$

ck $f(x) = 2x + 3$ $f'(x) = \frac{1}{2}x - \frac{3}{2} = g(x)$

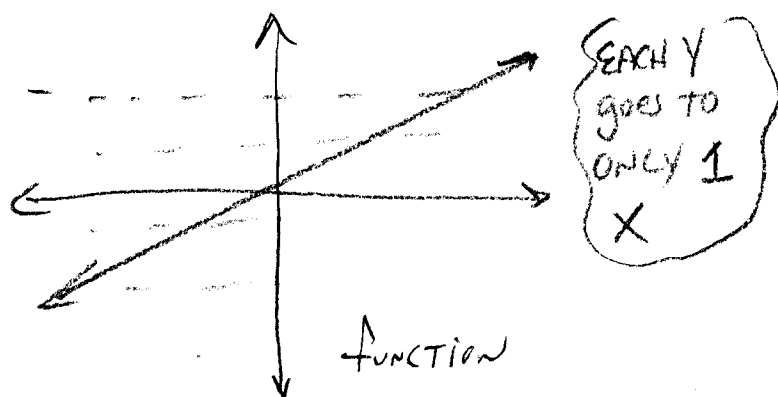
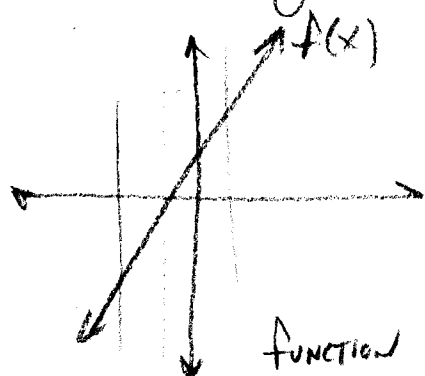
$$(f \circ g)(x) = 2\left(\frac{1}{2}x - \frac{3}{2}\right) + 3$$

$$= x - 3 + 3 \checkmark$$

$$(g \circ f)(x) \longrightarrow \frac{1}{2}(2x + 3) - \frac{3}{2}$$

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

Graphically $\Rightarrow$ PASS THE HORIZONTAL LINE TEST



Ch 7-8 Inverse Functions AND Relations

EX 2

Pg 391

Find the inverse of $y = f(x) = \frac{x+6}{2}$

$$f^{-1}(x) \Rightarrow x = \frac{y+6}{2} \quad \text{Solve for } y$$

$$2x = y + 6$$

$$\therefore \boxed{y = f^{-1}(x) = 2x - 6} \quad \boxed{y = f(x) = \frac{x+6}{2}}$$

ck: $f[f^{-1}(x)]$ or $(f \circ f^{-1})(x)$

$$f(x) = \frac{x+6}{2}$$

$$f(2x-6) = \frac{(2x-6)+6}{2} = x \quad \checkmark$$

$f^{-1}[f(x)]$ or $(f^{-1} \circ f)(x)$

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

$$\begin{aligned} f^{-1}\left(\frac{x+6}{2}\right) &= 2\left(\frac{x+6}{2}\right) - 6 \\ &= x \quad \checkmark \end{aligned}$$

See pg 391
for graphs
 $\Rightarrow$ Symmetrical
across the line
 $y = x \quad \checkmark$

Summary

If $f(x)$ and $f^{-1}(x)$ are inverse functions:

$$\Rightarrow \text{then } f(a) = b \text{ and } f^{-1}(b) = a$$

$\Rightarrow$ the graphs of $f(x)$ and $f^{-1}(x)$ are symmetric across the line $y = x$

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

$\Rightarrow$ PASS VERTICAL AND HORIZONTAL LINE TESTS

* Homework: Pg 393 # 8 to 11

The $()^{-1}$ NOTATION IS USED TO REPRESENT MANY INVERSES, LOOK AT YOUR SCIENTIFIC CALCULATOR:

$$x^{-1}, \sin^{-1}, \cos^{-1}, \tan^{-1}$$

To find the inverse of $f(x)$, Rewrite and swap x and y then solve for y .