6.2 Inverse Functions & Relations- Day 1 Notes

Objective: Find and graph the inverse of a function or relation

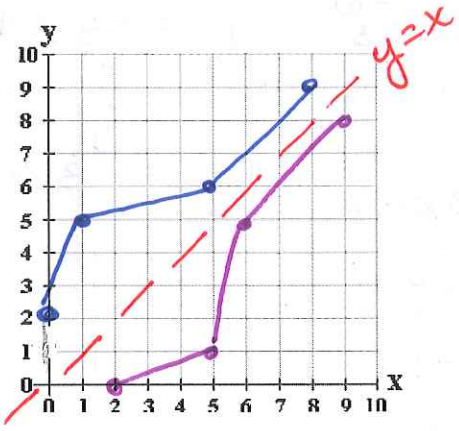
An inverse relation is the set of ordered pairs obtained by switching the x & y values. **If the inverse of $f(x)$ is a function, we use inverse function notation: $f^{-1}(x)$.**

Graph the relation and connect the points. Then graph the inverse. Identify the domain & range of each relation.

Relation:

x	0	1	5	8
y	2	5	6	9

Domain: [0, ∞)
Range: [2, 9]



Inverse:

x	2	5	6	9
y	0	1	5	8

Domain: [2, 9]
Range: [0, 8]

Property of Inverses: Two functions are inverses if they 'undo' one another. Inverse functions have their points reflected across the line $y=x$.

<u>To find inverses of functions:</u>
step 1: rewrite using x & y
step 2: switch the x & y
step 3: solve for y

Write the inverse of the function. Graph both the function & its inverse (label each.)

Ex: $f(x) = 2x - 8$

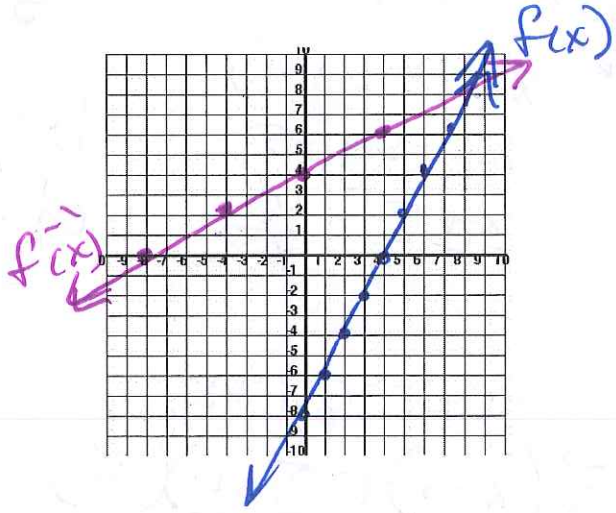
x	y
0	−8
4	0
6	4

$x = 2y - 8$
$+8 \quad +8$
$\frac{x+8}{2} = \frac{2y}{2}$

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

x	y
−8	0
0	4
4	6

$y = \frac{x}{2} + \frac{8}{2}$
$= \frac{1}{2}x + 4$



1. $f(x) = -3x + 6$ $\quad f^{-1}(x) = -\frac{1}{3}x + 2$

x	y
0	6
2	0
4	-6

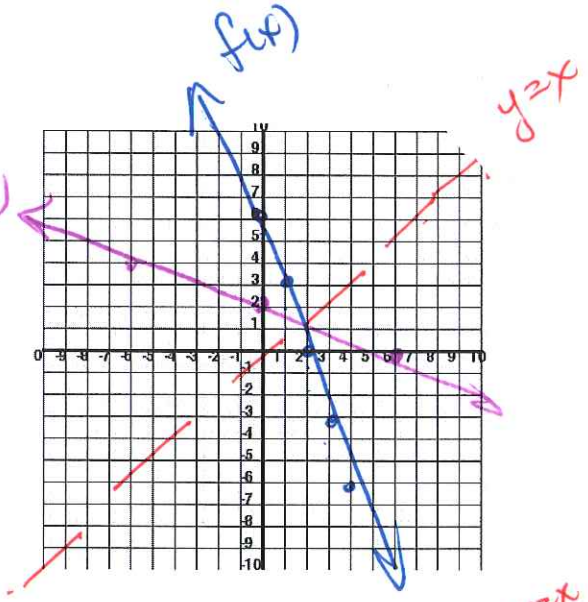
x	y
6	0
0	2
-6	4

$x = -3y + 6$

$\frac{x-6}{-3} = \frac{-3y}{-3}$

$y = \frac{x}{-3} - \frac{6}{-3}$

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



Write and graph the inverse of each function.

Ex. $f(x) = 3(x - 4)$ $\quad f^{-1}(x) = \frac{1}{3}x + 4$

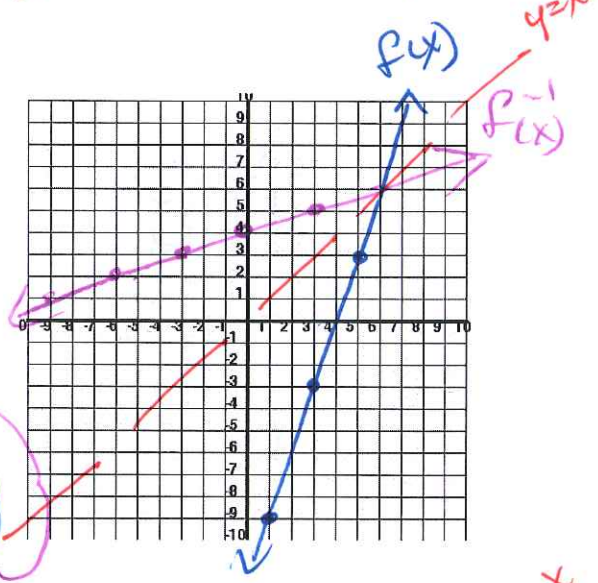
$= 3x - 12$

x	y
1	-9
3	-3
5	3

x	y

Solution Option #1

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



2. $f(x) = -5(x + 1)$ $\quad f^{-1}(x) = -\frac{1}{5}x - 1$

x	y
0	-5
-1	0
-2	5

x	y
-5	0
0	-1
5	-2

Solution option #2

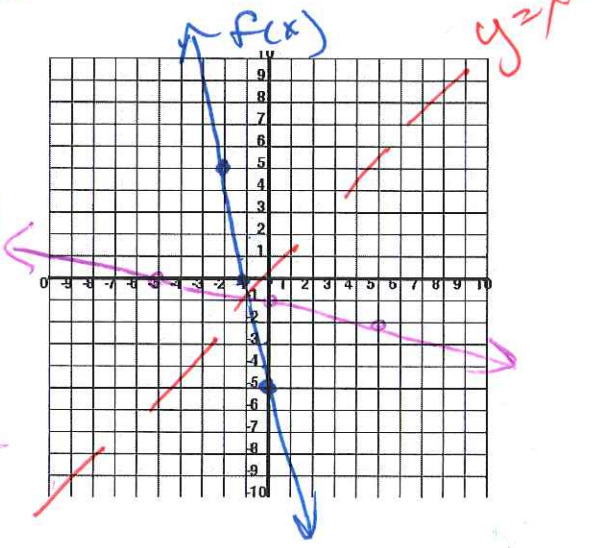
$x = -5(y + 1)$

$x = -5y - 5$

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

$y = \frac{x}{-5} - 1$

or $y = -\frac{1}{5}x - 1$



Write the inverse of each function.

Ex. $f(x) = -\frac{5}{3}x + 5$

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

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

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

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

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

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

$-3x + 9 = y$