Inverse Functions - Linear

Graph $g(x) = \frac{1}{2}x + 4$ and fill in the table.

x	g(x)
-10	-1
-8	0
-6	1
-4	2
-2	3
0	4
2	5
4	6
6	7
8	8

Graph $f(x) = 2x - 8$ and fill in the table

x	f(x)
-1	-10
0	-8
1	-6
2	-4
3	-2
4	0
5	2
6	4
7	6
8	8
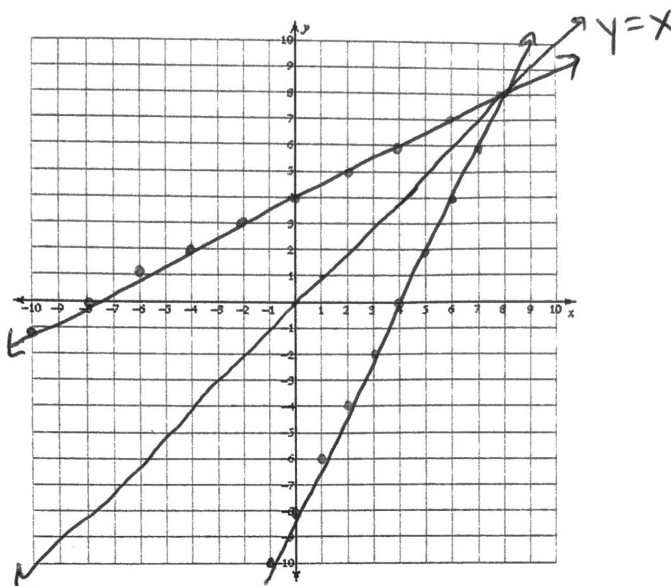
1. What do you notice about the ordered pairs in each function? Is there a relationship between f(x) and g(x)?

X & y switch

2. Graph the line y = x on the same graph. Describe your lines in relationship to this one.

g(x) & f(x) are reflected over the line y=x

To find the __inverse__ of a function:

1. switch x & y

2. solve for y

Symbol:

f^{-1}

Find the f^{-1}

a) f(x)= {(4, -3), (2, 8), (3, -8) (0, -3)}

$f^{-1}(x) = \{(-3, 4), (8, 2), (-8, 3), (-3, 0)\}$

b) y = 3x-7

$x = 3y+7$
$x-7 = 3y$
$\frac{x-7}{3} = y$

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

$x = -\frac{1}{2}y + 3$
$2 \cdot \frac{x}{x-3} = -\frac{1}{2}y \cdot 2$
$2x - 6 = y$

Note: Domain of a function = __range__ of its inverse
Range of a function = __domain__ of its inverse!

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Practice: Find the inverse of the following functions:

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

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

Domain: $\mathbb{R}$

Range: $\mathbb{R}$

$\rightarrow$ true for all linear equations

2) $g(x) = \frac{1}{3}x - 12$

$$x = \frac{1}{3}y - 12$$
$$3\sqrt{}\ \ x + 12 = \frac{1}{3}y \ \times 3$$
$$3x + 36 = y$$

Real-World Application:

Mr. Desmond decided to go to the North Carolina State Fair. Entry into the fair was $8, and then each ride was an additional $2.

a) Write a function f(x) to describe the total cost of going to the fair, with x representing the amount of rides purchased.

$$f(x) = 2x + 8$$

b) Find f(3) and describe its meaning in context.

$$f(3) = 2(3) + 8 = 14$$

It cost $14 to enter the fair and ride 3 rides.

c) If Mr. Desmond paid $20 at the fair, how many rides did she ride? Show your algebra!

$$20 = 2x + 8$$
$$-8 \qquad -8$$
$$\frac{12}{2} = \frac{2x}{2} \qquad x = 6 \text{ rides}$$

d) Write a function $f^{-1}(x)$ to describe the number of rides purchased given the total cost x.

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

e) If you went to the State Fair and spent $40, how many rides did you ride?

$$y = \frac{40-8}{2}$$
$$y = \frac{32}{2}$$
$$y = 16 \text{ rides}$$

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