

Homework: Inverse Relations

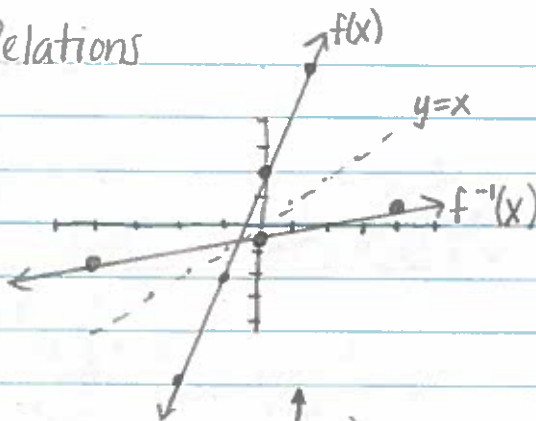
51.  $f(x) = 4x + 2$

$x = 4y + 2$

$x - 2 = 4y$

$\frac{1}{4}x - \frac{1}{2} = y$

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



55.  $f(x) = x^2 + 4, x \geq 0$

$x = y^2 + 4$

$x - 4 = y^2$

$\sqrt{x-4} = \sqrt{y^2}$

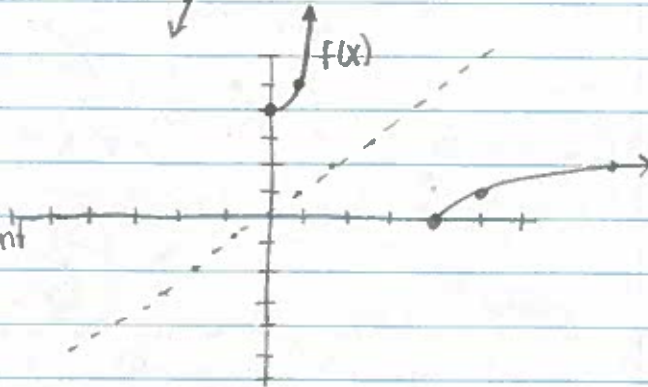
$\sqrt{x-4} = y$

$f^{-1}(x) = \sqrt{x-4}$

right+  
 $x \geq 4$

$\sqrt{x}$  parent

x	y
0	0
1	1
4	2
9	3



63.  $f(x) = \frac{3x}{x+2}$

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

$x(y+2) = 3y$

$xy + 2x = 3y$

$2x = 3y - xy$

$2x = y(3-x)$

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

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

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

67.  $f(x) = \frac{3x+4}{2x-3}$

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

$x(2y-3) = 3y+4$

$2xy - 3x = 3y + 4$

$2xy - 3y = 3x + 4$

$y(2x-3) = 3x+4$

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

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

$f^{-1}(x) = \frac{3x+4}{2x-3}$

73. a)  $f(-1) = 0$

b)  $f(1) = 2$

c)  $f^{-1}(1) = 0$

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

75.  $f(7) = 13$  and  $f$  is one-to-one.

then  $f^{-1}(13) = \boxed{7}$

77.  $D_f = [5, \infty)$ , then  $D_{f^{-1}} = [-2, \infty)$  (they switch since  
 $R_f = [-2, \infty)$   $R_{f^{-1}} = [5, \infty)$   $x$  and  $y$  switches)

81.  $f^{-1}(x)$  is increasing on the interval  $(f(0), f(5))$ .

1. Your wage is \$10.00 per hour plus \$0.75 for each unit produced per hour. So, your hourly wage  $y$  in terms of the number of units produced  $x$  is  $y = 10 + 0.75x$ .

a) Find the inverse function. What does each variable represent in the inverse function?

$$x = 10 + 0.75y$$

$$\frac{x-10}{.75} = \frac{0.75y}{.75}$$

$$f^{-1}(x) = \frac{x-10}{.75} \quad \text{or} \quad f^{-1}(x) = \frac{4}{3}x - \frac{40}{3}$$

$x = \text{hourly wage}$   
 $f^{-1}(x) = y = \# \text{ of units produced}$

b) Determine the number of units produced when your hourly wage is \$24.25.

$$24.25 = x \quad f^{-1}(x) = \frac{4}{3}(24.25) - \frac{40}{3}$$

$$f^{-1}(x) = 19$$

19 units produced

2. The function given by  $f(x) = k(2 - x - x^3)$  has an inverse, and  $f^{-1}(3) = -2$ . Find  $k$ .

$$3 = k(2 - (-2) - (-2)^3) \quad f(-2) = 3$$

$$3 = k(2 + 2 + 8)$$

$$3 = k(12)$$

$$\frac{1}{4} = k$$

3. Restrict the domain of  $f(x) = x^2 + 1$  to  $x \geq 0$ . Use your calculator to graph the function. Does the restricted function have an inverse? Explain.

Yes, because the function with the restricted domain is one-to-one.

