

**Advanced Algebra II Honors: Inverse Functions - Day 2**

I. Given  $f(x)$ , find  $f^{-1}(x)$ . Find the domain and range of  $f(x)$  and  $f^{-1}(x)$ .

\* Find those parts that make a function.

Be sure to restrict the domain so that  $f^{-1}(x)$  is a function when needed.

1.  $f(x) = 4x - 5$   
 $y = 4x - 5$   
 $x = \frac{y+5}{4}$   
 $f^{-1}(x) = \frac{x+5}{4}$

$D: \{TR\}$   
 $R: \{TR\}$   
 $D: \{TR\}$   
 $R: \{TR\}$

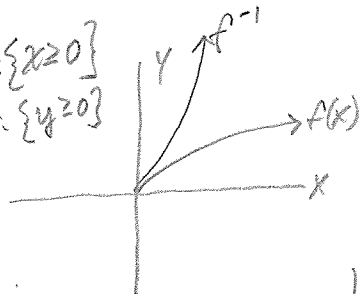
2.  $f(x) = 3x^2 + 2$   
 $y = 3x^2 + 2$   
 $x = \sqrt{\frac{y-2}{3}}$

$\pm \sqrt{\frac{y-2}{3}} = x \rightarrow f^{-1}(x) = \sqrt{\frac{x-2}{3}}$   
 $D: \{x \geq 2\}$   
 $R: \{y \geq 0\}$

see below  
 \*3.  $f(x) = x^2 + 2x + 1$   
 $y = x^2 + 2x + 1$   
 $x - 1 = y^2 + 2y + 1$   
 $x = (y+1)^2$   
 $\pm \sqrt{x} = y + 1$   
 $y = -1 \pm \sqrt{x}$



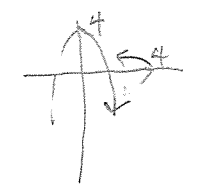
\*4.  $f(x) = \sqrt{x}$   
 $y = \sqrt{x}$   
 $x = y^2$   
 $f^{-1}(x) = x^2$



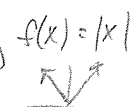
5.  $f(x) = 5x^2 - 10x + 8$   
 $y = 5x^2 - 10x + 8$   
 $x - 8 = 5(y^2 - 2y + 1)$   
 $x - 3 = 5(y-1)^2$   
 $\pm \sqrt{\frac{x-3}{5}} = y - 1$   
 $f^{-1}(x) = 1 \pm \sqrt{\frac{x-3}{5}}$

$D: \{x \geq 1\}$   
 vertex (1, 3)  
 $\frac{10}{10} = 1, 5 - 10 + 8$   
 $D: \{x \geq 3\}$   
 $R: \{y \geq 1\}$

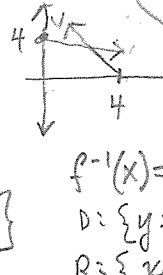
6.  $f(x) = -x^2 + 4$   
 $x = -y^2 + 4$   
 $x - 4 = -y^2$   
 $\pm \sqrt{4-x} = y$   
 $f^{-1}(x) = \pm \sqrt{4-x}$



7.  $f(x) = |x+2|, x \geq -2$   
 $y = |x+2|$   
 $x = |y+2|$



\*8.  $f(x) = |x-4|, x \leq 4$   
 $y = |x-4|$   
 $x = |y-4|$



8.  $f(x)$   
 $D: \{x \geq -1\}$   
 $R: \{y \geq 0\}$   
 $f^{-1}(x) = -1 + \sqrt{x}$   
 $D: \{x \geq 0\}$   
 $R: \{y \geq -1\}$

II. Find the inverse of each relation. (Does not need to be a function.)

1.  $y = 4x - 5$   
 $x = \frac{y+5}{4}$

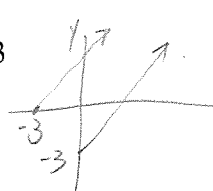
\*2.  $y = 6^x$   
 $x = 6^y$   
 $y = \log_6 x$

3.  $y = \log_3(5x)$   
 $x = \log_3(5y)$   
 $3^x = 5y$   
 $y = \frac{3^x}{5}$

4.  $y = |2x|$   
 $x = \frac{|y|}{2}$

5.  $\{(0, 1), (5, 6), (-2, -4)\}$   
 $\{(1, 0), (6, 5), (-4, -2)\}$

6.  $f(x) = |x+3|, x \geq -3$   
 $x = |y+3|$   
 $y \geq -3$



**FUNCTIONS FOREVER!!!!!!!**

**Can We Solve It??? YES, WE CAN!!!**

1. You have a coupon for \$50 off the price of a winter coat. When you arrive at the store, you find that the coats are on sale for 20% off. Use function notation to describe the cost with your coupon and the cost with the 20% discount. Would you pay less for the coat if you used your coupon after the discount? Explain

coupon  
 $C(x) = x - 50$

$$C(D(x)) = .8x - 50$$

$$D(C(x)) = .8(x - 50) = .8x - 40.0$$

discount  
 $D(x) = .8x$

Yes, the final cost is less if you use your coupon after the discount because  $C(D(x)) = .8x - 50$ .

2. The weekly cost of producing  $x$  units in a manufacturing process is given by the function  $C(x) = 60x + 750$ . The number of units produced in  $t$  hours during a week is given by  $x(t) = 50t$ ,  $0 \leq t \leq 40$ . Find, simplify and interpret  $C(x(t))$ .

$$C(x(t)) = 60(x(t)) + 750$$

$$C(x(0)) = 750 \text{ cost at } 0 \text{ hour.}$$

$$C(x(t)) = 60(50t) + 750$$

$$C(x(40)) = 3000(40) + 750$$

$$= 120,750 \text{ cost at } 40 \text{ hours}$$

$$C(x(t)) = 3000t + 750$$

$C(x(t))$  is a function that gives the weekly cost of producing  $x$  units in  $t$  hours.

3. Polls were taken in 1982 and in 1991 to determine whether American adults think the school year should be extended. The results can be represented by the following functions, where the function values are percents in decimal form. (Let  $t = 2$  represent 1982.)

Favor:  $f(t) = 0.0156t + 0.3389$

Oppose:  $g(t) = -0.0122t + 0.5544$

Don't know:  $h(t) = -0.0034t + 0.1067$

What percent favored extended the school year in 1982? In 1991?

$$\begin{aligned} \overset{1982}{f(2)} &= 0.0156(2) + 0.3389 \\ &= .3701 \\ &= 37.01\% \text{ favored} \end{aligned}$$

$$\begin{aligned} \overset{1991}{f(11)} &= 0.5105 \\ &= 51.05\% \text{ favored} \end{aligned}$$

Find and interpret the sum of  $f(t)$ ,  $g(t)$  and  $h(t)$ .

$$\begin{aligned} f(t) + g(t) + h(t) &= 0.0156t + 0.3389 \\ &\quad -0.0122t + 0.5544 \\ &\quad -0.0034t + 0.1067 \\ \hline &= 0t + 1 \end{aligned}$$

$$= 1$$

↑ is 100% of everyone surveyed.