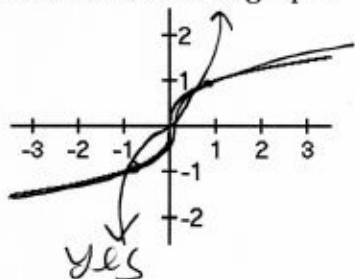


HW 6-4 Inverses  
Secondary III

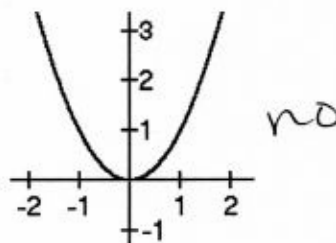
Name: Key  
Date: \_\_\_\_\_ Class: \_\_\_\_\_

Determine whether the following functions are one-to-one. If so, sketch a graph of the inverse on the same graph.

1.



2.



Find  $f^{-1}(x)$  for each of the following and state the domain of  $f^{-1}(x)$  including any inherited restrictions from  $f(x)$ .

3.  $f(x) = 3x - 6$

$$\begin{aligned} x &= 3y - 6 \\ x + 6 &= 3y \\ y &= \frac{x + 6}{3} \end{aligned}$$

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

5.  $f(x) = \sqrt{x - 3}$

$$\begin{aligned} x &= \sqrt{y - 3} \\ x^2 &= y - 3 \\ x^2 + 3 &= y \end{aligned}$$

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

7.  $f(x) = \sqrt[3]{x + 5}$

$$\begin{aligned} x &= \sqrt[3]{y + 5} \\ x^3 &= y + 5 \end{aligned}$$

$$f^{-1}(x) = x^3 - 5$$

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

$$\begin{aligned} x \cdot y + 1 & \\ x &= \frac{2y - 3}{y + 1} \end{aligned}$$

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

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

$$x \neq -1$$

$$\begin{aligned} xy + x &= 2y - 3 \\ x + 3 &= 2y - xy \\ x + 3 &= y(2 - x) \end{aligned}$$

6.  $f(x) = x^3$

$$y = x^3$$

$$\sqrt[3]{x} = y = f^{-1}(x)$$

8.  $f(x) = \frac{x + 3}{3x - 4}$      $x = \frac{y + 3}{3y - 4}$

$$\begin{aligned} 3xy - 4x &= y + 3 \\ 3xy - y &= 3 + 4x \\ y(3x - 1) &= 3 + 4x \\ y &= \frac{3 + 4x}{3x - 1} \end{aligned}$$

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

9. True or False. If  $f(x)$  is a one-to-one function with domain D and range R, then  $f^{-1}(x)$  is a one-to-one function with domain R and range D. Justify your answer.

True

10. Which function is the inverse of  $f(x) = 3x - 2$ ?

- a.  $f^{-1}(x) = \frac{x-3}{2}$     b.  $f^{-1}(x) = 2 - 3x$     c.  $f^{-1}(x) = \frac{x+2}{3}$     d.  $f^{-1}(x) = \frac{x-2}{3}$

11. Which function is the inverse of  $f(x) = x^3 + 1$ ?

- a.  $f^{-1}(x) = \sqrt[3]{x-1}$     b.  $f^{-1}(x) = \sqrt[3]{x} - 1$     c.  $f^{-1}(x) = \sqrt[3]{x+1}$     d.  $f^{-1}(x) = 1 - x^3$

$$x = y^3 + 1$$

$$\sqrt[3]{x-1} = y$$

Verify that the following functions are inverses using composition. (Honors Only)

12.  $f(x) = \frac{x+3}{4}$  and  $g(x) = 4x - 3$

$$f(g(x)) = \frac{(4x-3)+3}{4} = \frac{4x}{4} = x \quad \checkmark$$

$$g(f(x)) = 4\left(\frac{x+3}{4}\right) - 3 = x + 3 - 3 = x \quad \checkmark$$

### Review

Solve the following radical equations

1.  $2\sqrt{3x+2} = \sqrt{4x-9}$

$$8(3x+2) = 4x-9$$

$$24x + 16 = 4x - 9$$

$$20x = -25$$

$$x = \frac{-5}{4}$$

2.  $7 - \sqrt{x+4} = 2$

$$-\sqrt{x+4} = -5$$

$$\sqrt{x+4} = 5$$

$$x+4 = 25$$

$$x = 21$$

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

$$x-6 = x^2 - 4x + 4$$

$$0 = x^2 - 5x + 10$$

$$x = \frac{5 \pm \sqrt{25 - 4(1)(10)}}{2(1)}$$

$$= 5 \pm \sqrt{-15}$$

No Solution