

## Inverse Functions



(Section 6.2)

Obj: Find the inverse of a function or relation.



Obj: Determine whether two functions or relations are inverses.

### Inverse Functions

Suppose  $f(x)$  and  $f^{-1}(x)$  are inverse functions.  
Then,  $f(a) = b$  if and only if  $f^{-1}(b) = a$ .

$-1$  is not an exponent  
↙  
 $f^{-1}(x)$  denotes inverse of  $f(x)$

ie:  $f(x) = x + 4$                        $f^{-1}(x) = x - 4$

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the process of finding the inverse of a relation is simply the swapping of the x and y coordinates

Ex. 1) Find the inverse of the function:

$$f(x) = \{(5, 4), (-3, 1), (2, 8)\}$$

$$f^{-1}(x) = \{(4, 5), (1, -3), (8, 2)\}$$

Ex. 2) Find the inverse of the function:

$$\{(-3, 4), (-1, 1), (8, 5)\}$$

$$\{(4, -3), (1, -1), (5, 8)\}$$

# Inverse Functions

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$$m = -\frac{1}{2} \quad b = 1$$

\* Ex: Find the inverse of the function.  
Then graph the function and inverse.

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

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

$$(x = -\frac{1}{2}y + 1) \cdot 2$$

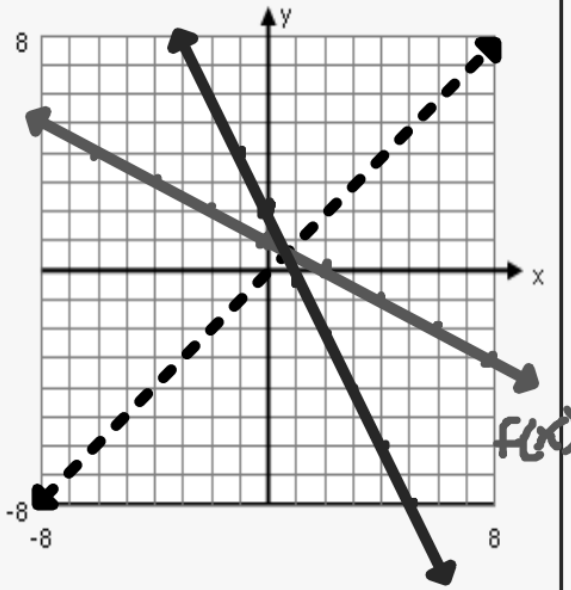
$$2x = -y + 2$$

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

$$-2x + 2 = y$$

$$m = -\frac{2}{1} \\ b = 2$$

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



## FIND INVERSE OF FUNCTION

- ① Replace  $f(x)$  with  $y$  in the original equation.
- ② Switch  $x$  and  $y$ .
- ③ Solve for  $y$ . (clear  $y$  by itself fractions and then solve)



NOTE: The graph is a reflection over the line  $y = x$ .

# Check for Understanding...



## Inverse Functions



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I can find the inverse of a function or relation.

I can determine whether two functions or relations are inverses.

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### ★ Verifying Inverses:

$f(x)$  and  $g(x)$  are inverse functions if and only if  $[f \circ g](x) = \underline{x}$  and  $[g \circ f](x) = \underline{x}$ .

\*Determine whether each pair of functions are inverse functions. Write *yes* or *no*.

4.  $f(x) = \frac{3}{4}x - 6$  and  $g(x) = \frac{4}{3}x + 8$

$$f \circ g(x) \Rightarrow \frac{3}{4} \left( \frac{4}{3}x + 8 \right) - 6$$
$$x + \cancel{6} - \cancel{6}$$
$$x$$

yes

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$$\begin{aligned} 5. \quad f(x) &= \frac{3}{2}x - 6 \quad \text{and} \quad g(x) = \frac{-12 - 2x}{3} \\ g \circ f(x) &= \frac{-12 - 2\left(\frac{3}{2}x - 6\right)}{3} \\ &= \frac{-12 - 3x + 12}{3} \\ &= \frac{-3x}{3} = -x \\ &\quad \text{No} \end{aligned}$$

Another way to find if 2 functions are inverses is find one <sup>inverse</sup> and compare to see if it matches the other one. <sub>function</sub>

$$\begin{aligned} 6. \quad f(x) &= 4x^2 \quad \text{and} \quad g(x) = 2\sqrt{x} \\ y &= 4x^2 \\ x &= \frac{\sqrt{y}}{2} \\ \frac{x}{4} &= y^2 \\ \sqrt{\frac{x}{4}} &= \sqrt{y^2} \\ \frac{\sqrt{x}}{2} &= y \end{aligned}$$

compare  
not same

NO

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7.  $f(x) = 2x^2 - 1$  and  $g(x) = \sqrt{\frac{x+1}{2}}$

$$y = 2x^2 - 1$$

$$x = 2y^2 - 1$$

$$\frac{x+1}{2} = \frac{2y^2}{2}$$

$$\sqrt{\frac{x+1}{2}} = \sqrt{y^2}$$

$$\sqrt{\frac{x+1}{2}} = y$$

match

yes