

Lesson 7–8

Example 1 Find an Inverse Relation

Find the inverse of the relation $\{(0, 7), (4, -3), (-3, 4), (-2, -2)\}$.

To find the inverse of this relation, reverse the coordinates of the ordered pairs.

The inverse of the relation is $\{(7, 0), (-3, 4), (4, -3), (-2, -2)\}$.

Example 2 Find an Inverse Function

a. Find the inverse of $f(x) = -\frac{3}{5}x + 1$.

Step 1 Replace $f(x)$ with y in the original equation.

$$f(x) = -\frac{3}{5}x + 1 \Rightarrow y = -\frac{3}{5}x + 1$$

Step 2 Interchange x and y .

$$x = -\frac{3}{5}y + 1$$

Step 3 Solve for y .

$$x = -\frac{3}{5}y + 1 \quad \text{Inverse}$$

$$5x = -3y + 5 \quad \text{Multiply each side by 5.}$$

$$3y + 5x = 5 \quad \text{Add } 3y \text{ to each side.}$$

$$3y = -5x + 5 \quad \text{Subtract } 5x \text{ from each side.}$$

$$y = -\frac{5}{3}x + \frac{5}{3} \quad \text{Divide each side by 3.}$$

Step 4 Replace y with $f^{-1}(x)$.

$$y = -\frac{5}{3}x + \frac{5}{3} \Rightarrow f^{-1}(x) = -\frac{5}{3}x + \frac{5}{3}$$

The inverse of $f(x) = -\frac{3}{5}x + 1$ is $f^{-1}(x) = -\frac{5}{3}x + \frac{5}{3}$.

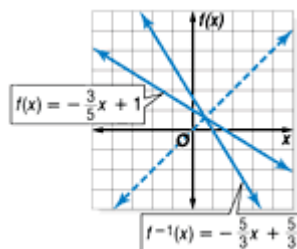
b. Graph the function and its inverse.

Graph both functions on the coordinate

plane. The graph of $f^{-1}(x) = -\frac{5}{3}x + \frac{5}{3}$ is

the reflection of the graph of $f(x) = -$

$\frac{3}{5}x + 1$ over the line $y = x$.



Example 3 Verify Two Functions are Inverses

Determine whether $f(x) = -7x + 3$ and $g(x) = \frac{-x - 3}{7}$ are inverse functions.

Check to see if the compositions of $f(x)$ and $g(x)$ are identity functions.

$$[f \circ g](x) = f[g(x)]$$

$$= f\left(\frac{-x - 3}{7}\right)$$

$$= -7\left(\frac{-x - 3}{7}\right) + 3$$

$$= x + 3 + 3$$

$$= x + 6 \neq x$$

$$[g \circ f](x) = g[f(x)]$$

$$= g(-7x + 3)$$

$$= \frac{-(-7x + 3) - 3}{7}$$

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

$$= \frac{7x - 6}{7} \neq x$$

The functions are not inverses since neither $[f \circ g](x)$ nor $[g \circ f](x)$ equals x .