

4-7 Study Guide**Inverse Linear Functions**

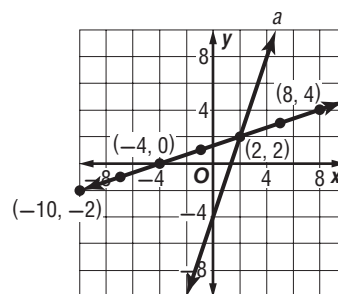
Inverse Relations An **inverse relation** is the set of ordered pairs obtained by exchanging the x -coordinates with the y -coordinates of each ordered pair. The domain of a relation becomes the range of its inverse, and the range of the relation becomes the domain of its inverse.

Example Find and graph the inverse of the relation represented by line a .

The graph of the relation passes through $(-2, -10)$, $(-1, -7)$, $(0, -4)$, $(1, -1)$, $(2, 2)$, $(3, 5)$, and $(4, 8)$.

To find the inverse, exchange the coordinates of the ordered pairs.

The graph of the inverse passes through the points $(-10, -2)$, $(-7, -1)$, $(-4, 0)$, $(-1, 1)$, $(2, 2)$, $(5, 3)$, and $(8, 4)$. Graph these points and then draw the line that passes through them.

**Exercises**

Find the inverse of each relation.

1. $\{(4, 7), (6, 2), (9, -1), (11, 3)\}$

2. $\{(-5, -9), (-4, -6), (-2, -4), (0, -3)\}$

3.

| x | y |
|-----|-----|
| -8 | -15 |
| -2 | -11 |
| 1 | -8 |
| 5 | 1 |
| 11 | 8 |

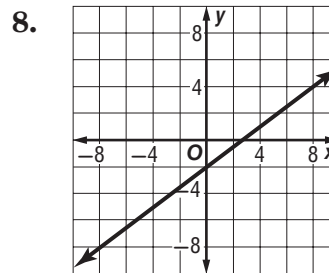
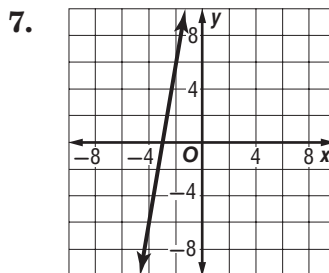
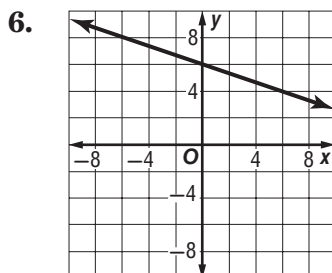
4.

| x | y |
|-----|-----|
| -8 | 3 |
| -2 | 9 |
| 2 | 13 |
| 6 | 18 |
| 8 | 19 |

5.

| x | y |
|-----|-----|
| -6 | 14 |
| -5 | 11 |
| -4 | 8 |
| -3 | 5 |
| -2 | 2 |

Graph the inverse of each relation.



4-7 Study Guide *(continued)***Inverse Linear Functions**

Inverse Functions A linear relation that is described by a function has an **inverse function** that can generate ordered pairs of the inverse relation. The inverse of the linear function $f(x)$ can be written as $f^{-1}(x)$ and is read *f of x inverse* or *the inverse of f of x*.

Example Find the inverse of $f(x) = \frac{3}{4}x + 6$.

| | | |
|---------------|----------------------------------|---------------------------------------|
| Step 1 | $f(x) = \frac{3}{4}x + 6$ | Original equation |
| | $y = \frac{3}{4}x + 6$ | Replace $f(x)$ with y . |
| Step 2 | $x = \frac{3}{4}y + 6$ | Interchange y and x . |
| Step 3 | $x - 6 = \frac{3}{4}y$ | Subtract 6 from each side. |
| | $\frac{4}{3}(x - 6) = y$ | Multiply each side by $\frac{4}{3}$. |
| Step 4 | $\frac{4}{3}(x - 6) = f^{-1}(x)$ | Replace y with $f^{-1}(x)$. |

The inverse of $f(x) = \frac{3}{4}x + 6$ is $f^{-1}(x) = \frac{4}{3}(x - 6)$ or $f^{-1}(x) = \frac{4}{3}x - 8$.

Exercises

Find the inverse of each function.

1. $f(x) = 4x - 3$

2. $f(x) = -3x + 7$

3. $f(x) = \frac{3}{2}x - 8$

4. $f(x) = 16 - \frac{1}{3}x$

5. $f(x) = 3(x - 5)$

6. $f(x) = -15 - \frac{2}{5}x$

7. TOOLS Jimmy rents a chainsaw from the department store to work on his yard. The total cost $C(x)$ in dollars is given by $C(x) = 9.99 + 3.00x$, where x is the number of days he rents the chainsaw.

a. Find the inverse function $C^{-1}(x)$.

b. What do x and $C^{-1}(x)$ represent in the context of the inverse function?

c. How many days did Jimmy rent the chainsaw if the total cost was \$27.99?