

Algebra 1 4.7

Find the inverse of a relation

Find the inverse of a linear function

relation (x, y) $y = 2x - 3$
inverse
function $(2, -6)$
inverse function $(-6, 2)$

domain

range

whiteboards

Find the inverse of each relation

Guided Practice

1A. $\{(-6, 8), (-15, 11), (9, 3), (0, 6)\}$

$(8, -6) (11, -15)$

1B.

x	-10	-4	-3	0
y	5	11	12	15

Guided Practice

$y = x$

$y = 1x + 0$

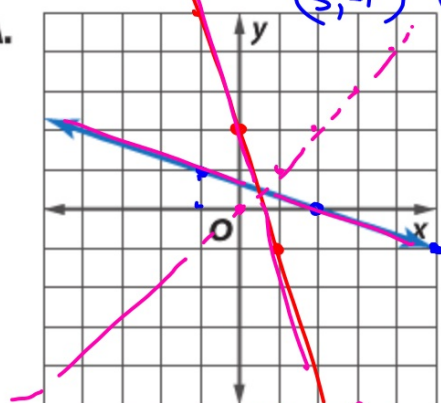
$(2, 0) \rightarrow (0, 2)$

$(-1, 1) \rightarrow (1, -1)$

$(5, -1) \rightarrow (-1, 5)$

Graph the inverse of each relation.

2A.

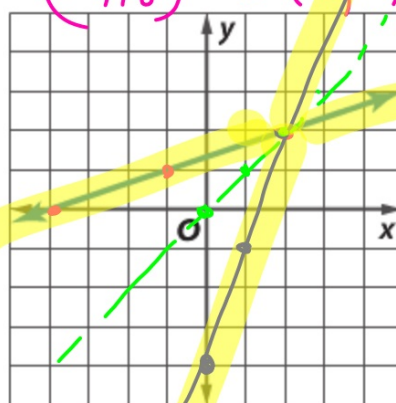


$y = x$ line of symmetry

$$y = x$$

$$y = 1x + 0$$

2B.



$$(2, 2) \rightarrow (2, 2)$$

$$(-1, 1) \rightarrow (1, -1)$$

$$(-4, 0) \rightarrow (0, -4)$$

y^{-1}

Find the inverse of each function:
"What should I expect to see?"

$$f(x) = 2x + 3$$

$$y = 2x + 3$$

Guided Practice

3A.

$$y = 4x - 12$$

$$y = \frac{1}{4}x + 3$$

$$x = 4y - 12$$

$$+12 \quad +12$$

$$\frac{x+12}{4} = \frac{4y}{4}$$

$$y =$$

$$f^{-1}(x) = 3x - 21$$

3B.

$$f(x) = \frac{1}{3}x + 7$$

$$y = \frac{1}{3}x + 7$$

$$x = \frac{1}{3}y + 7$$

$$-7 \quad -7$$

$$\frac{3}{1}(x-7) = \frac{1}{3}y \cdot \frac{3}{1}$$

1. Change to $y =$
(if necessary)
2. Exchange x & y
3. Solve for $y =$ again
4. Re-label f^{-1}

$$y = \frac{1}{3}x - 6$$

$$x = \frac{1}{3}y - 6$$

$$\frac{3}{1}(x+6) = \left(\frac{1}{3}y\right)\frac{3}{1}$$

$$y' = 3x + 18 =$$

$$\div \frac{1}{3}$$

$$\times \frac{3}{1}$$

Find the inverse of each function

14. $f(x) = 25 + 4x$

16. $f(x) = 4(x + 17)$

$$y = 4x + 68$$

Distributive property first?
(might be easier)

$$y = 25 + 4x$$

$$x = 25 + 4y$$

$$\begin{array}{r} x - 25 = 4y \\ \hline \frac{x-25}{4} = \frac{4y}{4} \end{array}$$

$$f^{-1}(x) = \frac{1}{4}x - \frac{25}{4}$$

$$\begin{array}{r} x = 4y + 68 \\ -68 \quad -68 \end{array}$$

$$\begin{array}{r} x - 68 = 4y \\ \hline \frac{x-68}{4} = \frac{4y}{4} \end{array}$$

$$f^{-1}(x) = \frac{1}{4}x - 17$$

1. Change to $y =$
2. Exchange x & y
3. Solve for $y =$
again
4. Relabel f^{-1}

$$f(x)$$

10. **DOWNLOADS** An online music subscription service allows members to download songs for \$0.99 each after paying a monthly service charge of \$3.99. The total monthly cost $C(x)$ of the service in dollars is $C(x) = 3.99 + 0.99x$, where x is the number of songs downloaded.

a. Find the inverse function.

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

c. How many songs were downloaded if a member's monthly bill is \$27.75?

$$C^{-1}(x) = \frac{x - 3.99}{0.99}$$

$$\begin{aligned} y &= 3.99 + 0.99x \\ x &= 3.99 + 0.99y \\ -3.99 &\quad -3.99 \end{aligned}$$

cost is a function of # of songs
songs is a function of cost

$$\frac{x - 3.99}{0.99} = \frac{0.99y}{0.99}$$

- 21. LANDSCAPING** At the start of the mowing season, Chuck collects a one-time maintenance fee of \$10 from his customers. He charges the Fosters \$35 for each cut. The total amount collected from the Fosters in dollars for the season is $C(x) = 10 + 35x$, where x is the number of times Chuck mows the Fosters' lawn.
- a. Find the inverse function.
 - b. What do x and $C^{-1}(x)$ represent in the context of the inverse function?
 - c. ~~How many times did Chuck mow the Fosters' lawn if he collected a total of \$780 from them?~~

Cost is a function of number of times mowed
of times mowed is a function of cost