

Algebra 1 4.7

Find the inverse of a relation

Find the inverse of a linear function

relation

inverse

function

inverse function

$$(3, 5) \rightarrow (5, 3)$$
$$(a, b) \rightarrow (b, a)$$

domain ~~x-word~~

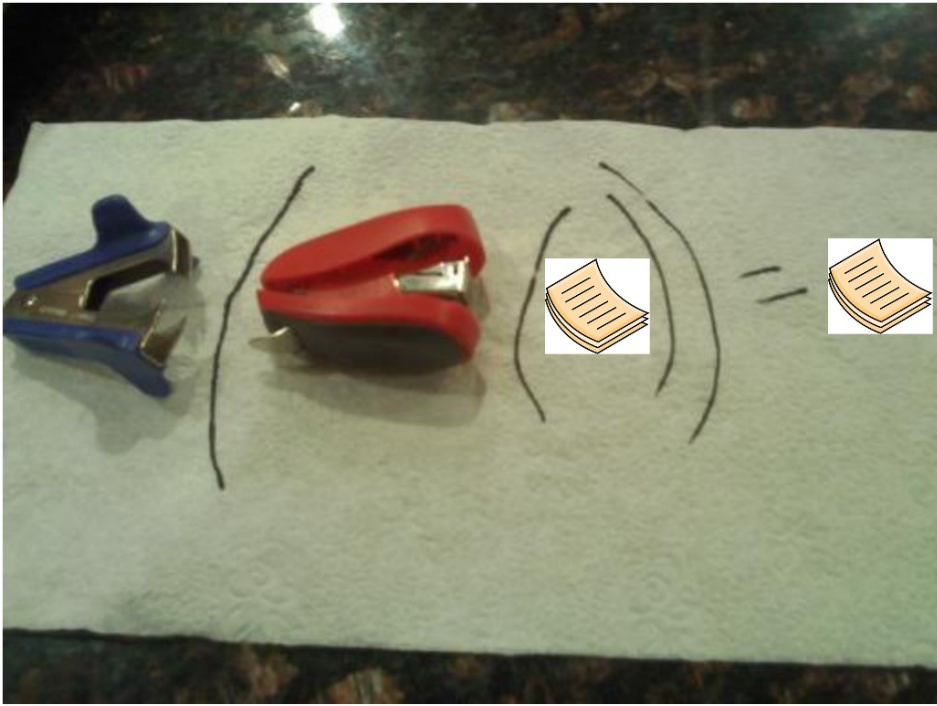
range ~~y-word~~

whiteboards

$$y = 2x + 3$$

$$x = 2y + 3$$

Quiz 4.5-4.6 (Graphing calculators)

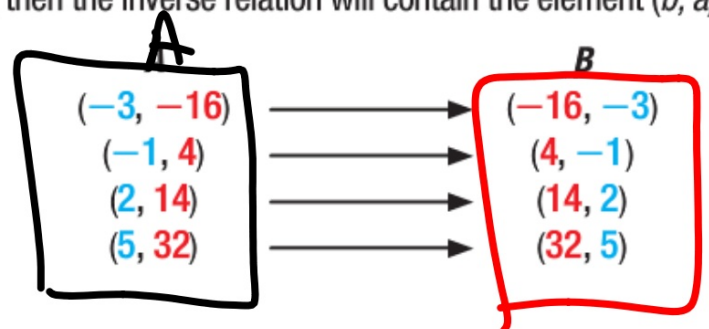


They do the opposite **thing**.... like multiplying and dividing

KeyConcept Inverse Relations

Words If one relation contains the element (a, b) , then the inverse relation will contain the element (b, a) .

Example A and B are inverse relations.



$$D = -3, -1, 2, 5$$
$$R = -16, 4, 14, 32$$

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$$R = -3, -1, 2, 5$$

Example 1 Inverse Relations

Find the inverse of each relation.

- a.** $\{(4, -10), (7, -19), (-5, 17), (-3, 11)\}$

b.

x	-4	-1	5	9
y	-13	-8.5	0.5	6.5

recopy

$(-4, -13)$ $(-1, -8.5)$ $(5, 0.5)$ $(9, 6.5)$

inverse

Guided Practice

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

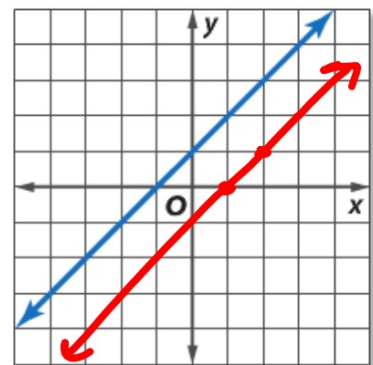
1B.

<i>x</i>	-10	-4	-3	0
<i>y</i>	5	11	12	15

Example 2 Graph Inverse Relations

Graph the inverse of the relation.

$(1, 0)$
 $(2, 1)$
 $(3, 2)$



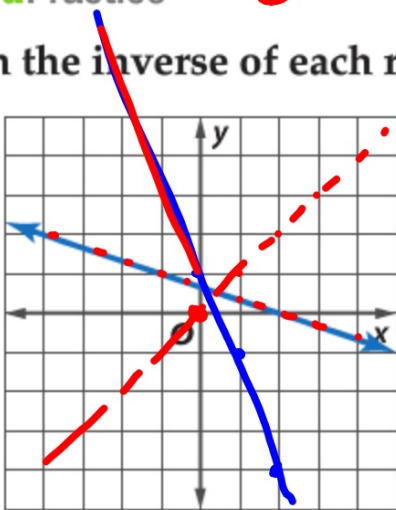
Exchange ordered pairs
How can I get some from the graph?

Line of symmetry

$y = x + 0$
Guided Practice $y = x$

Graph the inverse of each relation.

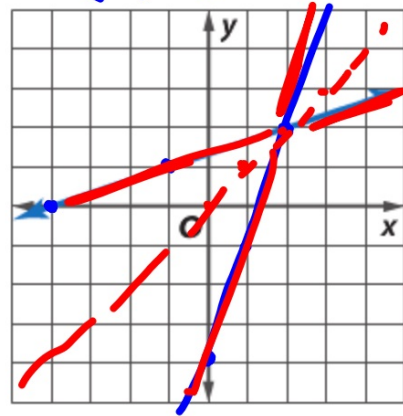
2A.



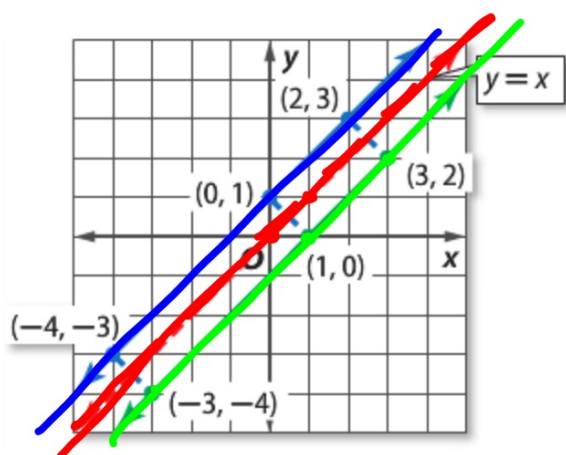
$(2, -4)$
 $(1, -1)$
 $(0, 2)$

$-4, 0 \rightarrow (0, -4)$
 $-1, 1 \rightarrow (1, -1)$
 $2, 2 \rightarrow (2, 2)$

2B.



where is $y=x$?



$$y = x$$

inverse: reflection over $y = x$

$$y = x + 1$$

Line of symmetry:
 $y = x$

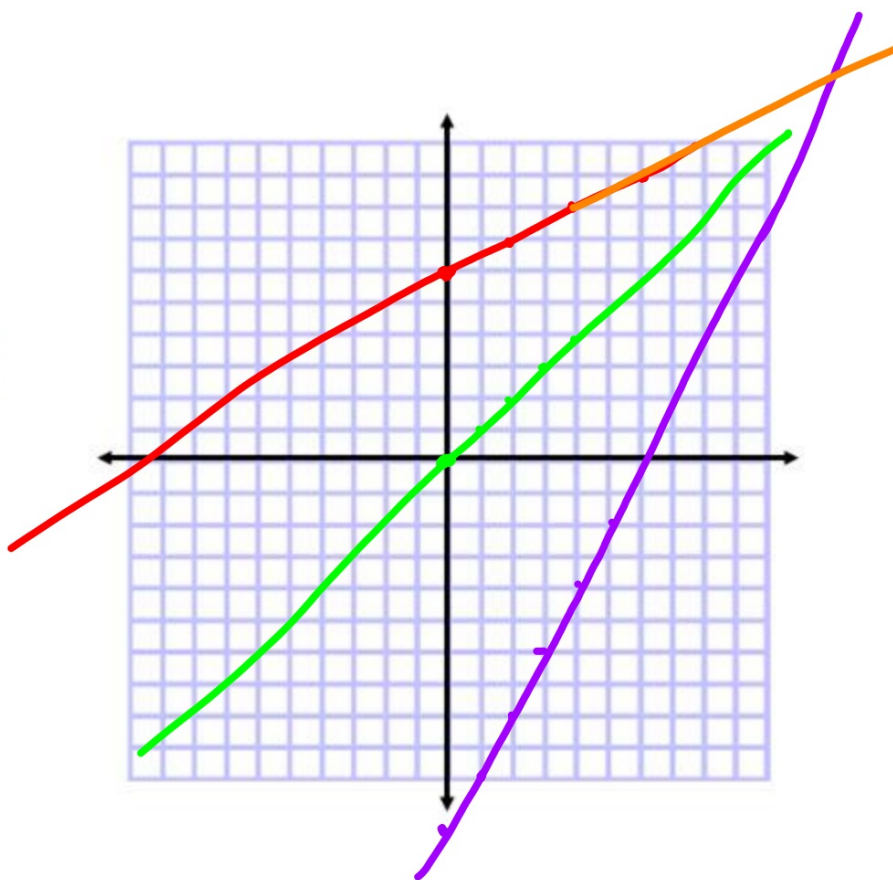
Writing equations:
slope-intercept form

$$y = \frac{1}{2}x + 6$$

$$x = \frac{1}{2}y + 6$$

$$\frac{2}{1} \cdot x - 6 \cdot \frac{2}{1} = \frac{1}{2}y \cdot \frac{2}{1}$$

$$2x - 12 = y$$



KeyConcept Finding Inverse Functions

To find the inverse function $f^{-1}(x)$ of the linear function $f(x)$, complete the following steps.

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

Step 2 ✓ Interchange y and x in the equation.

Step 3 ✓ Solve the equation for y .

Step 4 ✓ Replace y with $f^{-1}(x)$ in the new equation.

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

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

Remember: x and y trade places...

To consider: "What is happening to x ? What would be the opposite thing?"
...so I should expect to see....

Example 3 Find Inverse Linear Functions

Find the inverse of each function.

a. $f(x) = 4x - 8$

b. $f(x) = -\frac{1}{2}x + 11$

Guided Practice

3A. $f(x) = 4x - 12$

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