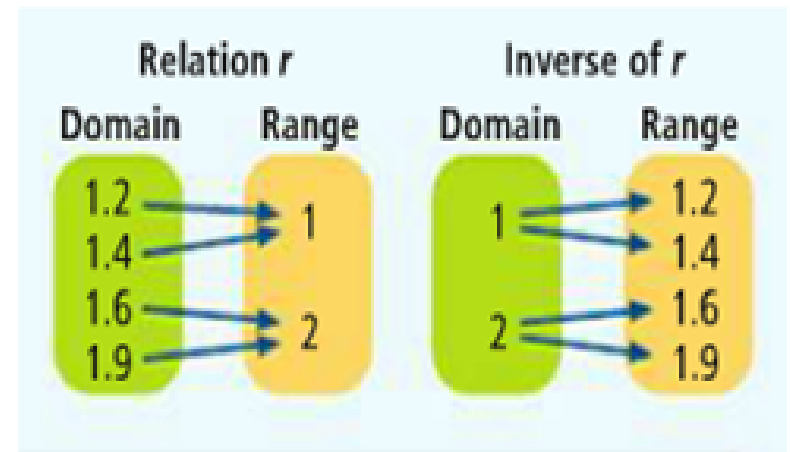


## 6.7 Inverse Relations and Functions

- INVERSE RELATION:



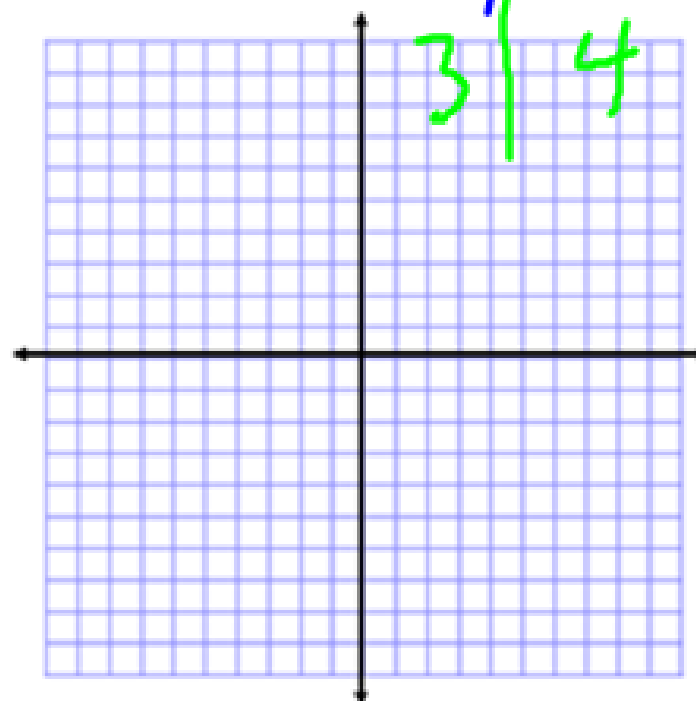
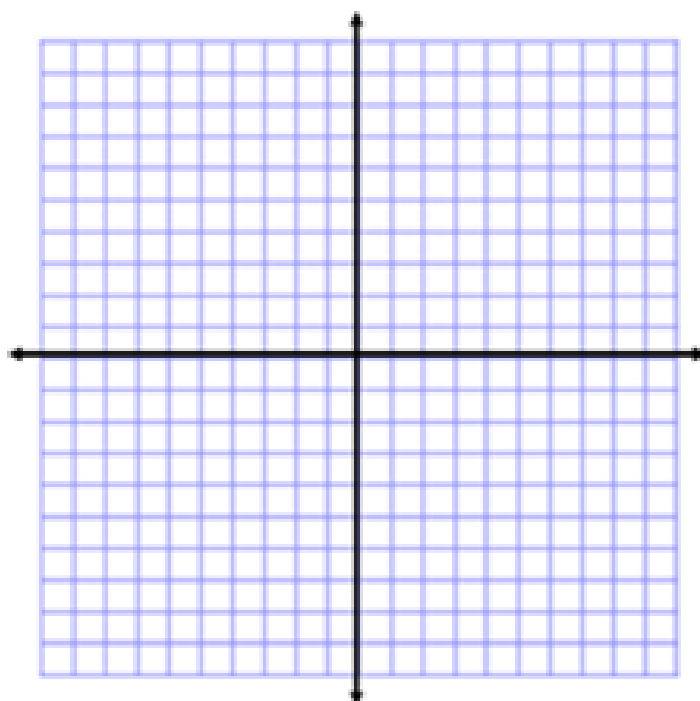
Ex. 1 What is the inverse of relation  $s$ ?

$x$	$y$
0	-1
2	0
3	2
4	3

inverse of  $s$

$x$	$y$
-1	0
0	2
2	3
3	4

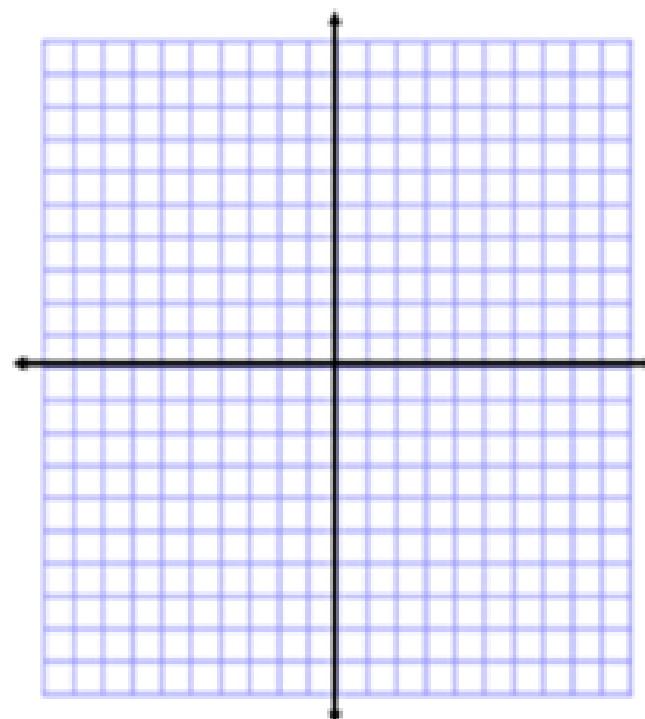
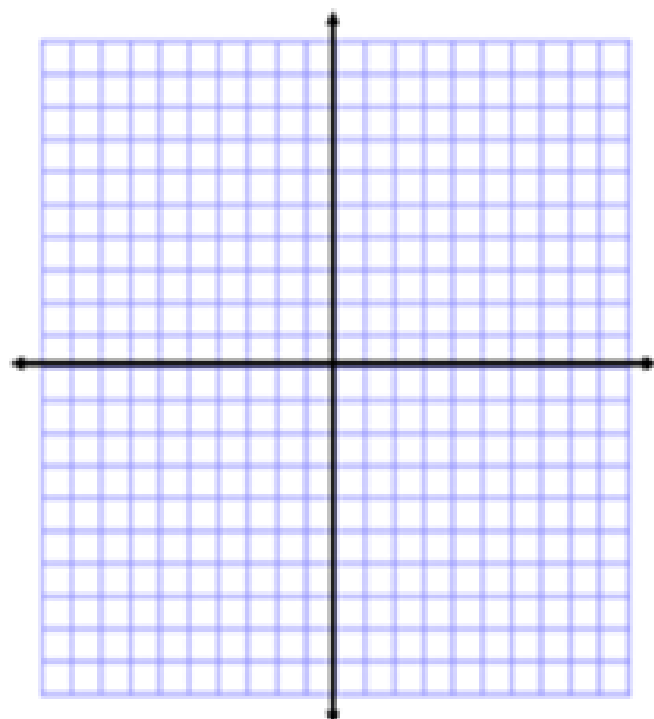
Ex. 2 What are the graphs of  $s$  and its inverse?



Ex. 3 What are the graphs of  $t$  and its inverse?

Relation  $t$

$x$	0	1	2	3
$y$	-5	-4	-3	-3



*inverse of  $t$*

$x$	-5	-4	-3
$y$	0	1	2

## How to find the inverse of $f(x)$ ? Finding $f^{-1}(x)$

$f^{-1}(x) \rightarrow$  "the inverse of  $f(x)$ "

- ① Change  $f(x)$  to  $y$
- ② Switch  $x$  and  $y$
- ③ Solve for  $y$ .
- ④ change  $y$  to  $f^{-1}(x)$

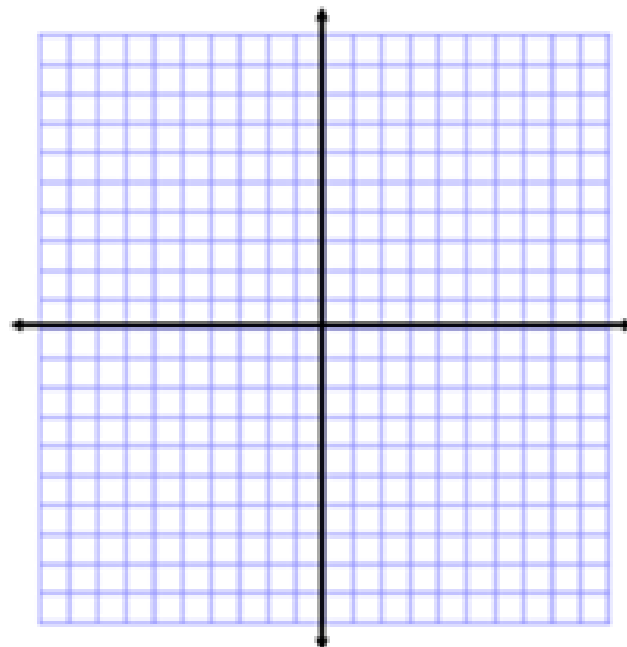
Ex. 4 What is the inverse of each relation?

$$y = 2x + 8$$

$$x = 2y + 8$$

$$x - 8 = 2y$$

$$\frac{x - 8}{2} = y$$



$$\frac{x - 8}{2} = f^{-1}(x)$$

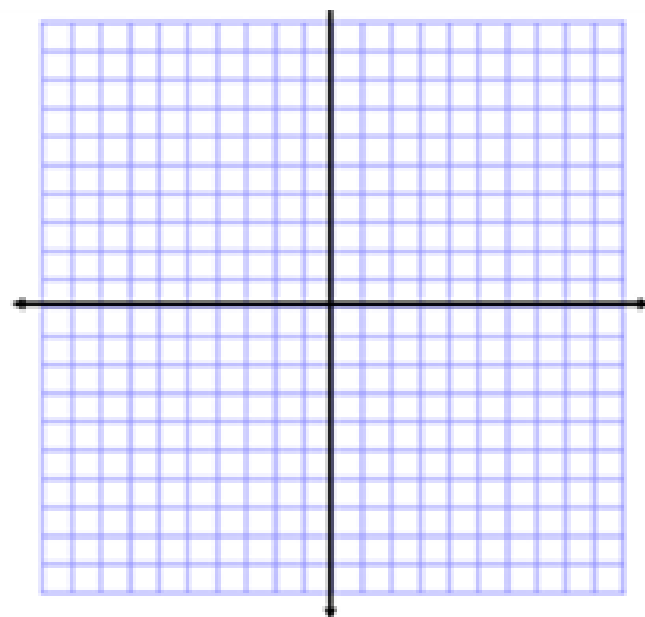
Ex. 6 What is the inverse of each relation?  $y = \sqrt{x-6}$

$$(x)^2 = (\sqrt{y-6})^2$$

$$x^2 = y - 6$$

$$x^2 + 6 = y$$

$$x^2 + 6 = f^{-1}(x)$$



Ex. 7 Consider the function  $f(x) = 6 - 4x$ .

- a) What are the domain and range of  $f$ ?
- b) What is  $f^{-1}$ , the inverse of  $f$ ?
- c) What are the domain and range of  $f^{-1}$ ?
- d) Is  $f^{-1}$  a function? Explain.

Ex. 8 Consider the function  $f(x) = \sqrt{x - 2}$ .

- a) What are the domain and range of  $f$ ?
- b) What is  $f^{-1}$ , the inverse of  $f$ ?
- c) What are the domain and range of  $f^{-1}$ ?
- d) Is  $f^{-1}$  a function? Explain.



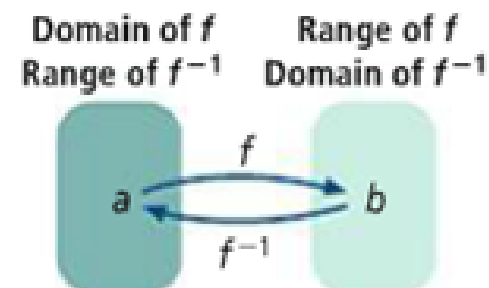
Ex. 9 The function  $d = 4.9t^2$  represents the  $d$  in meters, that an object falls in  $t$  seconds due to Earth's gravity. Find the inverse of the function. How long, in seconds, does it take for the cliff diver to reach the water when he is 24 meters above the water?

take note

## Key Concept Composition of Inverse Functions

If  $f$  and  $f^{-1}$  are inverse functions, then

$(f^{-1} \circ f)(x) = x$  and  $(f \circ f^{-1})(x) = x$  for  $x$  in the domains of  $f$  and  $f^{-1}$ , respectively.



Ex. 10 Let  $f(x) = 2x - 6$ . What is each of the following?

a)  $f^{-1}(x)$

b)  $(f \circ f^{-1})(x)$

c)  $(f^{-1} \circ f)(x)$

Ex. 11 Let  $f(x) = (x + 7)^3$ . What is each of the following?

a)  $f^{-1}(x)$   $\rightarrow y = (x + 7)^3$

b)  $(f \circ f^{-1})(x)$

c)  $(f^{-1} \circ f)(x)$

$$\sqrt[3]{x} = \sqrt[3]{(y + 7)^3}$$

$$\sqrt[3]{x} = y + 7$$

$$\sqrt[3]{x} - 7 = y = f^{-1}(x)$$

Ex. 12 Let  $f(x) = \sqrt{x-3}$ . What is each of the following?

a)  $f^{-1}(x)$

b)  $(f \circ f^{-1})(x)$

c)  $(f^{-1} \circ f)(x)$

Ex. 13 Let  $f(x) = \frac{6}{x-2}$ . What is each of the following?

d)  $f^{-1}(x)$

e)  $(f \circ f^{-1})(2)$

f)  $(f^{-1} \circ f)(2)$

Ex. 5 What is the inverse of each relation?  $y = x^2 - 5$

