

**10.4****Inverse of a Function**

For use with Exploration 10.4

**Essential Question** How are a function and its inverse related?**1 EXPLORATION:** Exploring Inverse Functions

**Work with a partner.** The functions  $f$  and  $g$  are *inverses* of each other. Compare the tables of values of the two functions. How are the functions related?

$x$	0	0.5	1	1.5	2	2.5	3	3.5
$f(x)$	0	0.25	1	2.25	4	6.25	9	12.25

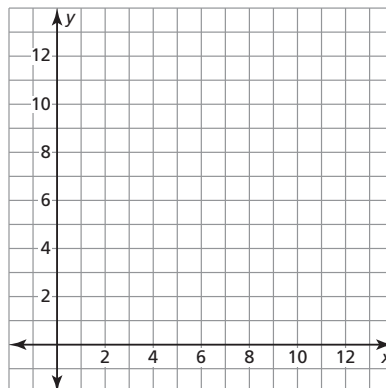
$x$	0	0.25	1	2.25	4	6.25	9	12.25
$g(x)$	0	0.5	1	1.5	2	2.5	3	3.5

**2 EXPLORATION:** Exploring Inverse Functions

Go to [BigIdeasMath.com](http://BigIdeasMath.com) for an interactive tool to investigate this exploration.

**Work with a partner.**

- Plot the two sets of points represented by the tables in Exploration 1. Use the coordinate plane below.
- Connect each set of points with a smooth curve.
- Describe the relationship between the two graphs.
- Write an equation for each function.



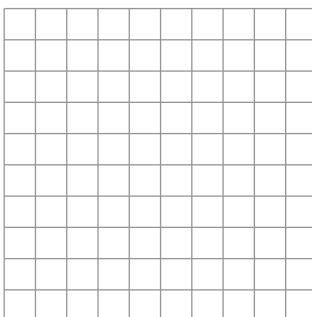
**10.4** Inverse of a Function (continued)**Communicate Your Answer**

3. How are a function and its inverse related?
4. A table of values for a function  $f$  is given. Create a table of values for a function  $g$ , the inverse of  $f$ .

$x$	0	1	2	3	4	5	6	7
$f(x)$	1	2	3	4	5	6	7	8

$x$								
$g(x)$								

5. Sketch the graphs of  $f(x) = x + 4$  and its inverse in the same coordinate plane. Then write an equation of the inverse of  $f$ . Explain your reasoning.



**10.4****Notetaking with Vocabulary**

For use after Lesson 10.4

In your own words, write the meaning of each vocabulary term.

inverse relation

inverse function

**Core Concepts****Inverse Relation**

When a relation contains  $(a, b)$ , the inverse relation contains  $(b, a)$ .

**Notes:**

**Finding Inverses of Functions Algebraically**

**Step 1** Set  $y$  equal to  $f(x)$ .

**Step 2** Switch  $x$  and  $y$  in the equation.

**Step 3** Solve the equation for  $y$ .

**Notes:**

**Horizontal Line Test**

The inverse of a function  $f$  is also a function if and only if no horizontal line intersects the graph of  $f$  more than once.

**Notes:**

**10.4** Notetaking with Vocabulary (continued)

**Extra Practice**

In Exercises 1 and 2, find the inverse of the relation.

1.  $(1, -1), (2, 5), (4, -2), (6, 8), (8, 9)$

2.

<b>Input</b>	-3	-1	0	1	3
<b>Output</b>	4	2	2	5	3

<b>Input</b>					
<b>Output</b>					

In Exercises 3–5, solve  $y = f(x)$  for  $x$ . Then find the input when the output is 3.

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

4.  $f(x) = 3x - 2$

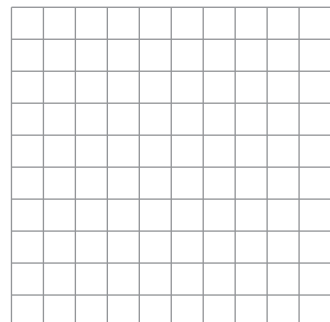
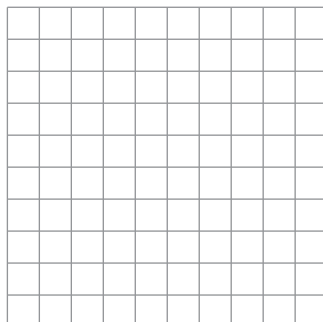
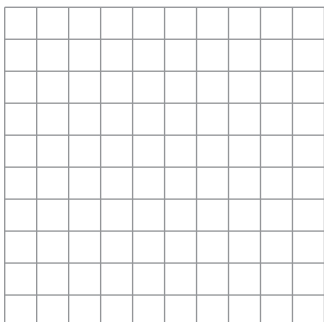
5.  $f(x) = 4x^2$

In Exercises 6–11, find the inverse of the function. Then graph the function and its inverse.

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

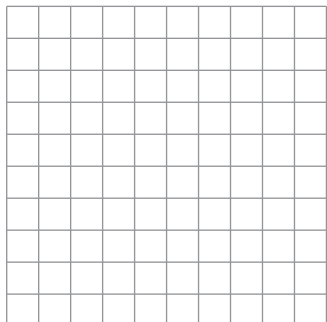
7.  $f(x) = -3x + 2$

8.  $f(x) = \frac{1}{2}x + 2$

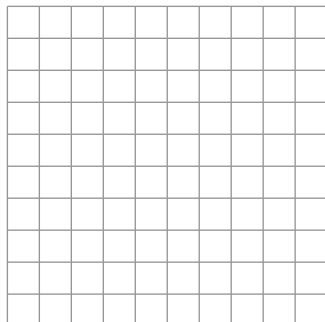


**10.4** Notetaking with Vocabulary (continued)

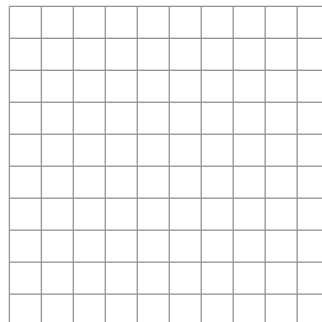
9.  $f(x) = 2x^2, x \geq 0$



10.  $f(x) = -x^2 + 5, x \leq 0$



11.  $f(x) = 16x^2 + 3, x \geq 0$



In Exercises 12–17, determine whether the inverse of  $f$  is a function. Then find the inverse.

12.  $f(x) = \sqrt{x + 4}$

13.  $f(x) = \sqrt{3x - 9}$

14.  $f(x) = 2\sqrt{x - 4}$

15.  $f(x) = 3x^2$

16.  $f(x) = 5x^2 - 1$

17.  $f(x) = -\sqrt{2x + 3} - 5$