

LESSON

18

Relations and Functions

Review It!

When you work with relations and functions, remember these words:

**relation** a set of ordered pairs

**function** a relation in which each first value is paired with one and only one second value

**vertical line test for functions** a vertical line crosses only one point on the graph

**ordered pair** a pair of numbers that can be graphed as a point on a coordinate plane

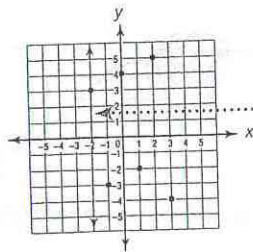
The vertical line test is an easy way to determine whether the graph of a relation shows a function. The graph below shows this relation.

$$\{(-2, 3), (-1, -3), (0, 4), (1, -2), (2, 5), (3, -4)\}$$

Step 1 Draw a vertical line through each point.

Each vertical line crosses the graph only \_\_\_\_\_ time(s).

There is only one second value for each first value.



REMEMBER Vertical is up and down.

So, the graph shows a \_\_\_\_\_.

Try It!

Decide whether each relation is a function. Write *yes* or *no*.



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

yes

2.  $\{(-1, 3), (-1, 2), (-1, 1), (-1, 6)\}$

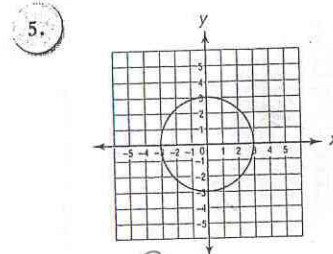
no

3.  $\{(0, 2), (1, 3), (1, -2), (2, 3)\}$

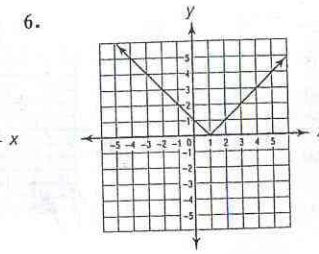
no

4.  $\{(1, 1), (2, 1), (3, 1), (4, 1)\}$

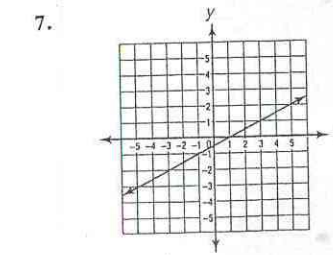
yes



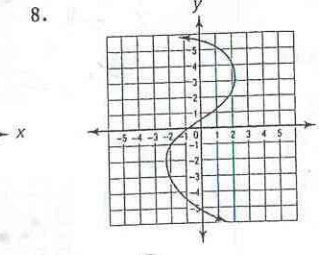
no



yes



yes



no

1. Are any x-values the same or are they all different?  
the same, or all different?

3. Are any x-values the same or are they all different?  
the same, or all different?

5. What type of line should you draw?  
vertical, or horizontal?

**On Your Own!**

Circle the best answer for each question.

1. Which relation is a function?

- A.  $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$
- B.  $\{(1, 1), (1, 2), (3, 3), (4, 4)\}$
- C.  $\{(1, 1), (2, 2), (2, 3), (4, 4)\}$
- D.  $\{(1, 1), (2, 2), (3, 3), (3, 4)\}$

*Same x, can't have 2 y values*

2. Which relation is a function?

- A.  $\{(-1, -2), (-1, 2), (2, -2)\}$
- B.  $\{(-1, 2), (1, -2), (2, 1)\}$
- C.  $\{(-1, 2), (-1, -2), (-1, 1)\}$
- D.  $\{(-1, 1), (-1, -1), (-1, 2)\}$

*Same x, can't have 2 y's*

3. Which relation is NOT a function?

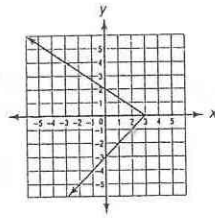
- A.  $\{(-5, 1), (-4, 2), (-3, -2), (-2, -1)\}$
- B.  $\{(5, 1), (6, -2), (7, 1), (8, -2)\}$
- C.  $\{(5, 1), (5, -2), (6, 2), (7, 3)\}$
- D.  $\{(5, 1), (-2, 5), (6, 2), (7, 3)\}$

4. Which relation is NOT a function?

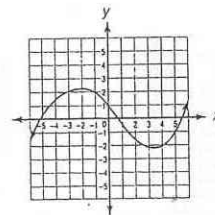
- A.  $\{(-2, 5), (-4, 6), (-5, -2)\}$
- B.  $\{(-2, 5), (-1, 4), (0, 4), (1, 4)\}$
- C.  $\{(-2, 5), (1, 5), (2, 5), (3, 5)\}$
- D.  $\{(-2, 5), (1, 5), (-2, 2), (1, 7)\}$

5. Which graph does NOT show a function?

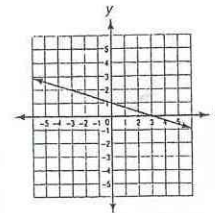
A.



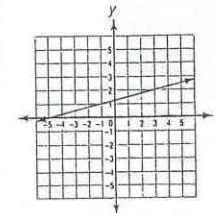
B.



C.



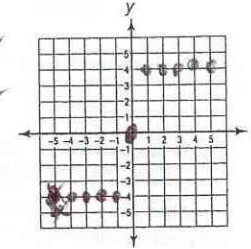
D.



6. Part A Graph the ordered pairs on the coordinate grid.

- 1 2 3 4 5 6 7  
 $\{(-5, -4), (-4, -4), (-3, -4), (-2, -4), (-1, -4), (0, 0), (1, 4), (2, 4), (3, 4), (4, 4), (5, 4)\}$

*I disagree w/ answer key*



Is the relation is a function?

~~NO~~ Yes

Part B Name an ordered pair that would make the relation NOT a function.

~~2, 2~~



Fill in the blanks.

7. A test that shows whether the graph of a relation is a function is the

vertical line test.

8. Any group of ordered pairs is a relation.

9. A relation in which each first value is paired with one and only one second value

is a function.

*See attached pages*

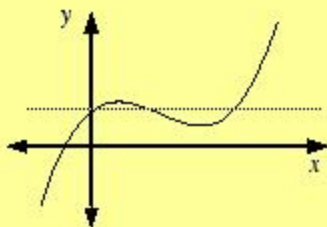
## Horizontal Line Test

A test use to determine if a function is one-to-one. If a horizontal line intersects a function's graph more than once, then the function is not one-to-one.

Note: The function  $y = f(x)$  is a function if it passes the vertical line test. It is a one-to-one function if it passes both the vertical line test and the horizontal line test.

### Horizontal Line Test

This function is not one-to-one since there is a horizontal line that hits the graph more than once.



## Vertical Line Test

A test use to determine if a relation is a function. A relation is a function if there are no vertical lines that intersect the graph at more than one point.

### Vertical Line Test

The graph is a function since there are no vertical lines that hit the graph more than once.

