



NAME _____

Module 9 Using Functions
Lesson 1 Defining Relations and Functions

Find the domain and range of each relation.

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

Domain = $\{-4, 0, 2, 3\}$ _____

Range = $\{0, 1, 4, 5\}$ _____

2. $F = \{(-4, 0), (-3, -2), (1, 0), (2, 1), (1, 2)\}$

Domain = $\{-4, -3, 1, 2\}$ _____

Range = $\{-2, 0, 1, 2\}$ _____

3.

x	y
-2	3
-1	1
3	3
4	-2

Domain = $\{-2, -1, 3, 4\}$ _____

Range = $\{-2, 1, 3\}$ _____

4.

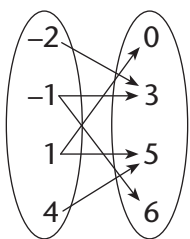
x	y
-5	5
0	4
0	5
1	4

Domain = $\{-5, 0, 1\}$ _____

Range = $\{4, 5\}$ _____

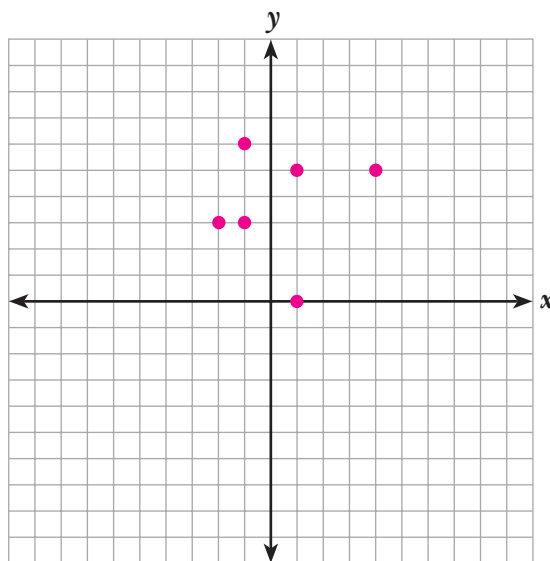
Graph on the coordinate plane the relation represented by each mapping diagram. Then, name the domain and range of each relation.

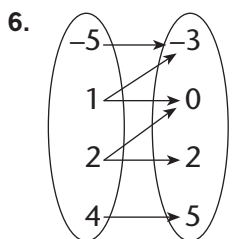
5.



Domain = $\{-2, -1, 1, 4\}$ _____

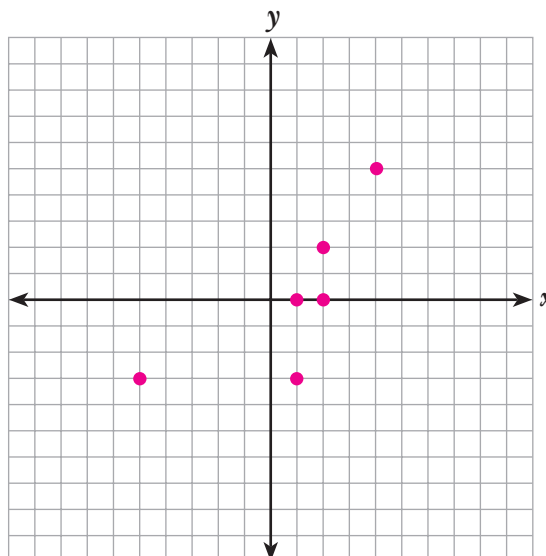
Range = $\{0, 3, 5, 6\}$ _____





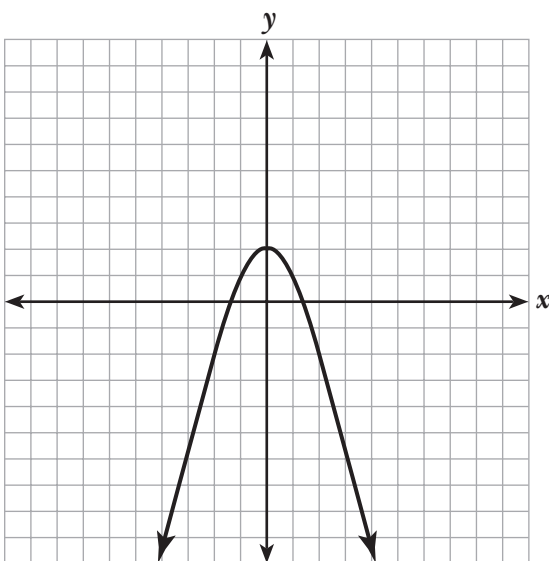
Domain = {-5, 1, 2, 4}

Range = {-3, 0, 2, 5}



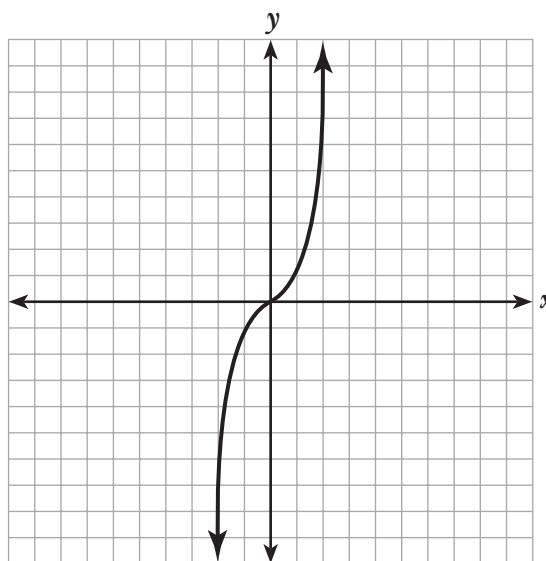
Find the domain and range of each function.

7. $y = -x^2 + 2$



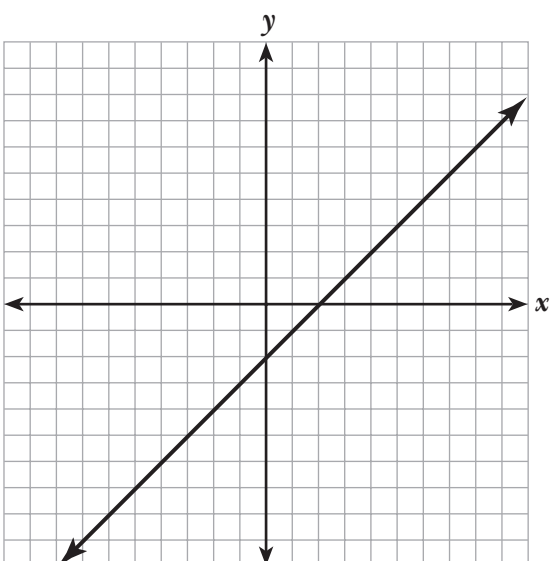
Domain = \mathfrak{R} ; Range = $\{y: y \leq 2\}$

8. $y = x^3$



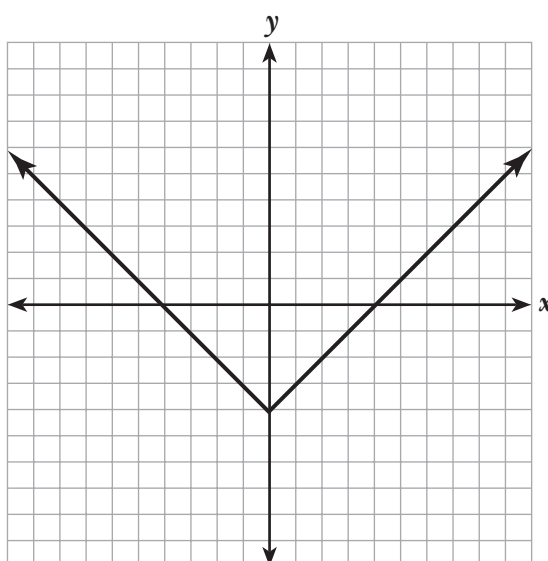
Domain = \mathfrak{R} ; Range = \mathfrak{R}

9. $y = x - 2$



Domain = \mathcal{R} ; Range = \mathcal{R}

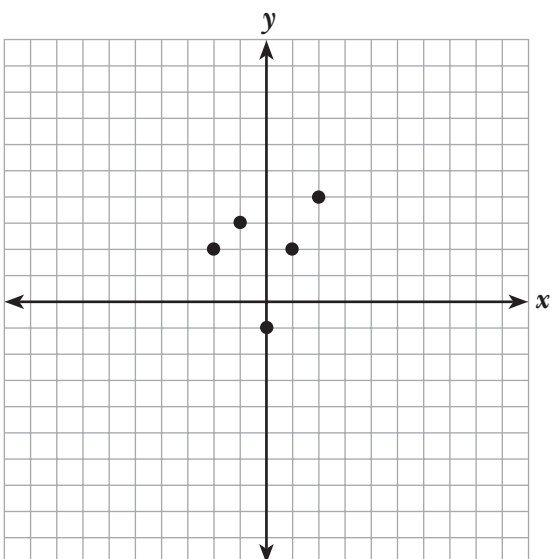
10. $y = |x| - 4$



Domain = \mathcal{R} ; Range = $\{y: y \geq -4\}$

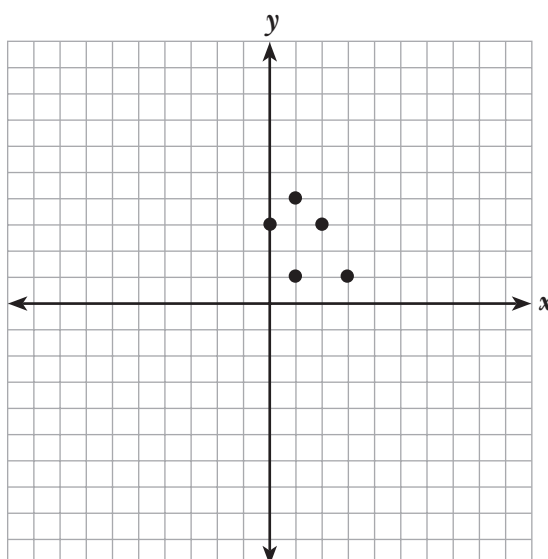
Determine whether each graph represents a function. Explain.

11.



The graph represents a function. No two ordered pairs have the same first element.

12.

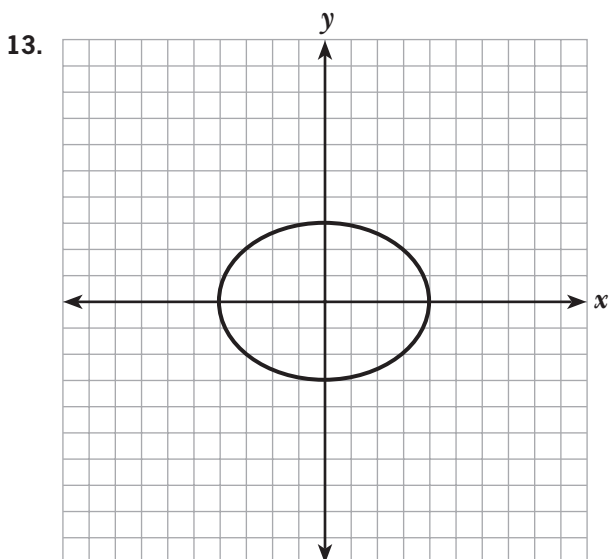


The graph does not represent a function. The ordered pairs (1, 1) and (1, 4) have the same first element.

Possible Journal Response

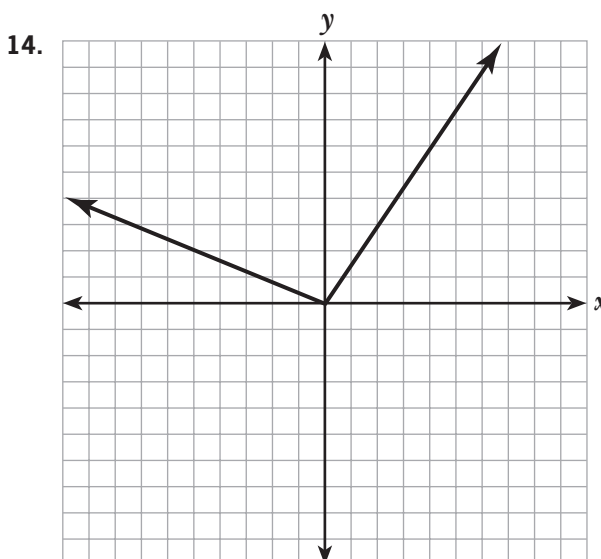
1. The oven is like a function machine in that it produces an output (cake) from an input (gooey substance). However, the same input can produce many different outputs. For example, one batter may produce a delicious cake while an identical batter produces a burnt cake, which is not a function.
2. Look at the arrows showing the mappings. If the relation is a function, no element in the "input" column should have more than one arrow coming out of it.
3. There can be no more than n elements in the range. Otherwise, at least one element of the domain would have to map to more than one element of the range.

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The graph does not represent a function.

The graph fails the vertical line test.



The graph represents a function. The

graph passes the vertical line test.

Journal

- In the lesson introduction, Frogan compared the oven to a function machine. What did he mean? After studying functions, do you agree with Mr. Frogan? Explain.
- Explain how you can tell whether a relation represented by a mapping diagram is a function.
- Suppose that a function has n elements in its domain. What do you know about the number of elements in the range? Explain.
- Explain the theory behind the vertical line test. Why is the test effective in determining whether a graph represents a function?
- Is every line a function? Explain.

Cumulative Review

Evaluate each expression for the given value(s) of the variable(s).

- | | |
|------------------------------------------------------------------|--------------------------------------------------------------|
| 1. $a - 9$ if $a = 3$ <u>-6</u> | 2. $4c - 12$ if $c = -4$ <u>-28</u> |
| 3. $r^2 - 4r$ if $r = -5$ <u>45</u> | 4. $a^2 - 3b$ if $a = 2$ and $b = -4$ <u>16</u> |
| 5. $\frac{n}{4} + 3n^2 - \frac{1}{4}n$ if $n = 5$ <u>75</u> | 6. $\sqrt{p - 4} - p$ if $p = 40$ <u>-34</u> |
| 7. $\sqrt[3]{3t} - \sqrt{t}$ if $t = 9$ <u>0</u> | 8. $4rs - (r + s)^2$ if $r = -1$ and $s = 3$ <u>-16</u> |
| 9. $-2 h - 7 + h^3j - 3j$ if $h = -2$ and $j = -3$
<u>15</u> | 10. $gh - g^2h - 8h^2$ if $g = -5$ and $h = -4$
<u>-8</u> |

Possible Journal Response (continued)

- If a vertical line passes through a graph more than once, the graph does not represent a function. Since any two points on a vertical line have the same x -coordinate, having more than one point of intersection indicates that an element of the domain (x -coordinate) maps to more than one element of the range (y -coordinate).
- No. Vertical lines do not represent functions, since each point on a vertical line has the same x -coordinate. However, all nonvertical lines represent functions.