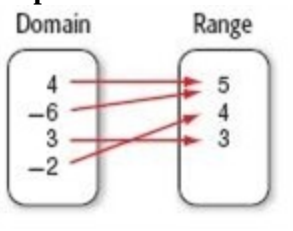
1-7 Functions

Determine whether each relation is a function. Explain.

20.



SOLUTION:

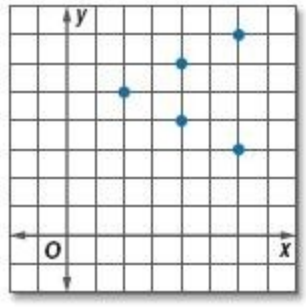
A function is a relation in which each element of the domain is paired with exactly one element of the range. So, this relation is a function.

21.

SOLUTION:

A function is a relation in which each element of the domain is paired with exactly one element of the range. In the domain, the value 4 is paired with both 5 and 6. So, this relation is not a function.

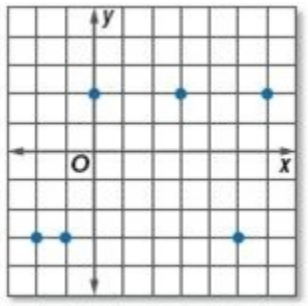
24.



SOLUTION:

A function is a relation in which each element of the domain is paired with exactly one element of the range. When $x = 4$, $y = 4$ and $y = 6$. So, this relation is not a function.

25.



SOLUTION:

This is a function because no vertical line can be drawn so that it intersects the graph more than once.

Determine whether each relation is a function.

29. $y = -8$

SOLUTION:

This is a function because no vertical line can be drawn so that it intersects the graph more than once.

30. $x = 15$

SOLUTION:

This is not a function because a vertical line can be drawn so that it intersects the graph more than once.

If $f(x) = -2x - 3$ and $g(x) = x^2 + 5x$, find each value.

36. $g(-3)$

SOLUTION:

$$\begin{aligned} g(x) &= (x)^2 + 5x && \text{Original equation} \\ g(-3) &= (-3)^2 + 5(-3) && \text{Replace } x \text{ with } -3. \\ &= 9 + 5(-3) && \text{Evaluate powers.} \\ &= 9 + (-15) && \text{Multiply.} \\ &= -6 && \text{Add.} \end{aligned}$$

38. $f(0) - 7$

SOLUTION:

$$\begin{aligned} f(x) - 7 &= [-2(x) - 3] - 7 && \text{Original equation} \\ f(0) - 7 &= [-2(0) - 3] - 7 && \text{Replace } x \text{ with } 0. \\ &= [0 - 3] - 7 && \text{Multiply.} \\ &= [-3] - 7 && \text{Simplify.} \\ &= -10 && \text{Subtract.} \end{aligned}$$

40. $g(-6m)$

SOLUTION:

$$\begin{aligned} g(x) &= (x)^2 + 5(x) && \text{Original equation} \\ g(-6m) &= (-6m)^2 + 5(-6m) && \text{Replace } x \text{ with } -6m. \\ &= 36m + 5(-6m) && \text{Evaluate powers.} \\ &= 36m^2 - 30m && \text{Multiply.} \end{aligned}$$

42. $f(r + 2)$

SOLUTION:

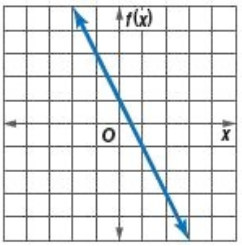
$$\begin{aligned} f(x) &= -2(x) - 3 && \text{Original equation} \\ f(r+2) &= -2(r+2) - 3 && \text{Replace } x \text{ with } r+2. \\ &= -2r - 4 - 3 && \text{Distributive Property} \\ &= -2r - 7 && \text{Subtract.} \end{aligned}$$

44. $3[g(n)]$

SOLUTION:

$$\begin{aligned} g(x) &= (x)^2 + 5x && \text{Original equation} \\ 3[g(x)] &= 3\left[(x)^2 + 5x\right] && \text{Product of 3 and } g(x) \\ 3[g(n)] &= 3\left[(n)^2 + 5(n)\right] && \text{Replace } x \text{ with } n. \\ &= \left[n^2 + 5(n)\right] && \text{Evaluate powers.} \\ &= 3\left[n^2 + 5n\right] && \text{Multiply.} \\ &= 3n^2 + 15n && \text{Distributive Property} \end{aligned}$$

54. **ERROR ANALYSIS** Corazon thinks $f(x)$ and $g(x)$ are representations of the same function. Maggie disagrees. Who is correct? Explain your reasoning.



x	$g(x)$
–1	1
0	–1
1	–3
2	–5
3	–7

SOLUTION:

The graph has a y-intercept of 1. It also contains the point (1, –1), which we can use to determine the slope:

$$\begin{aligned} m &= \frac{y_2 - y_2}{x_2 - x_1} \\ &= \frac{-1-1}{1-0} \\ &= \frac{-2}{1} \\ &= -2 \end{aligned}$$

The equation for $f(x)$ is: $f(x) = -2x + 1$.

For the table, we can see that as x increases by 1, $g(x)$ decreases by 2, which means the slope of $g(x)$ is –2. But the y-intercept for $g(x)$ is (0, –1), giving $g(x) = -2x - 1$.

The graph and table are representative of different functions.

58. For the function $y = 15x - 4$, assume the domain is only values of x from 0 to 5. What is the range of the function?

F All values from 15 to 20.
G All values from $\frac{4}{15}$ to $\frac{3}{15}$.
H All values from –4 to 71.
J Two values from –4 to 71.

SOLUTION:

To find the range of the function, substitute the endpoints of the domain into the function.

First find $f(0)$.

$$\begin{aligned} f(x) &= 15x - 4 && \text{Original equation} \\ f(0) &= 15(0) - 4 && \text{Replace } x \text{ with } 0. \\ &= 0 - 4 && \text{Multiply.} \\ &= -4 && \text{Subtract.} \end{aligned}$$

Then find $f(5)$

$$\begin{aligned} f(x) &= 15x - 4 && \text{Original equation} \\ f(51) &= 15(5) - 4 && \text{Replace } x \text{ with } 5. \\ &= 75 - 4 && \text{Multiply.} \\ &= 71 && \text{Subtract.} \end{aligned}$$

The range of the function is all values from –4 to 71, so choice H is the correct answer.

59. Which statement best describes how to determine when a graph represents a function?

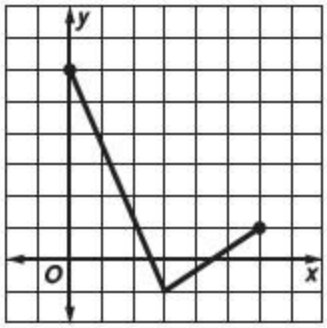
A At least one vertical line intersects the function.
B Every horizontal line intersects the function.
C Every vertical line intersects the function exactly one time.
D Every vertical line intersects the function no more than one time.

SOLUTION:

A graph represents a function when it passes the vertical line test. If every vertical line intersects the function no more than one time, the graph passes the vertical line test and is a function.

So, the correct answer is choice D.

60. Which of the following best describes the relation shown in the graph?



F Domain: $0 \le x \le 6$; Range: $-1 \le y \le 6$; the relation is a function
G Domain: $0 \le x \le 6$; Range: $-1 \le y \le 6$; the relation is a not function
H Domain: $-1 \le x \le 6$; Range: $0 \le y \le 6$; the relation is a function
J Domain: $-1 \le x \le 6$; Range: $0 \le y \le 6$; the relation is a function

SOLUTION:

The domain of the relation is the range of x-values. The minimum x-value is 0 and the maximum x-value is 6. Therefore, the domain is $0 \le x \le 6$.

The range of the function is the range of y-values. The minimum y-value is –1 and the maximum y-value is 6. Therefore, the range is $-1 \le x \le 6$.

The relation is a function because it passes the vertical line test.

The correct answer is choice F.