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Study Guide and Intervention

7AF3.3, 7MR2.5

Functions

A **function** connects an input number, x , to an output number, $f(x)$, by a rule. To find the value of a function for a certain number, substitute the number into the function value in place of x , and simplify.

Example 1 Find $f(5)$ if $f(x) = 2 + 3x$.

$$f(x) = 2 + 3x$$

Write the function.

$$f(5) = 2 + 3(5) \text{ or } 17$$

Substitute 5 for x into the function rule and simplify.

$$\text{So, } f(5) = 17.$$

You can organize the input, rule, and output of a function using a function table.

Example 2 Complete the function table for $f(x) = 2x + 4$.

Substitute each value of x , or input, into the function rule. Then simplify to find the output.

$$f(x) = 2x + 4$$

$$f(-1) = 2(-1) + 4 \text{ or } 2$$

$$f(0) = 2(0) + 4 \text{ or } 4$$

$$f(1) = 2(1) + 4 \text{ or } 6$$

$$f(2) = 2(2) + 4 \text{ or } 8$$

Input x	Rule $2x + 4$	Output $f(x)$
-1	$2(-1) + 4$	2
0	$2(0) + 4$	4
1	$2(1) + 4$	6
2	$2(2) + 4$	8

Exercises

Find each function value.

1. $f(1)$ if $f(x) = x + 3$ **4**

2. $f(6)$ if $f(x) = 2x$ **12**

3. $f(4)$ if $f(x) = 5x - 4$ **16**

4. $f(9)$ if $f(x) = -3x + 10$
-17

5. $f(-2)$ if $f(x) = 4x - 1$
-9

6. $f(-5)$ if $f(x) = -2x + 8$
18

Complete each function table.

7. $f(x) = x - 10$

x	$x - 10$	$f(x)$
-1	$(-1) - 10$	-11
0	$0 - 10$	-10
1	$1 - 10$	-9
2	$2 - 10$	-8

8. $f(x) = 2x + 6$

x	$2x + 6$	$f(x)$
-3	$2(-3) + 6$	0
-1	$2(-1) + 6$	4
2	$2(2) + 6$	10
4	$2(4) + 6$	14

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

x	$2 - 3x$	$f(x)$
-2	$2 - 3(-2)$	8
0	$2 - 3(0)$	2
3	$2 - 3(3)$	-7
4	$2 - 3(4)$	-10

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7AF3.3

Slope

The slope m of a line passing through points (x_1, y_1) and (x_2, y_2) is the ratio of the difference in the y -coordinates to the corresponding difference in the x -coordinates. As an equation, the slope is given by

$$m = \frac{y_2 - y_1}{x_2 - x_1}, \text{ where } x_1 \neq x_2.$$

Example 1 Find the slope of the line that passes through $A(-1, -1)$ and $B(2, 3)$.

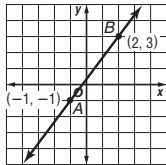
$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Definition of slope}$$

$$m = \frac{3 - (-1)}{2 - (-1)} \quad (x_1, y_1) = (-1, -1),$$

$$(x_2, y_2) = (2, 3)$$

$$m = \frac{4}{3} \quad \text{Simplify.}$$

Check When going from left to right, the graph of the line slants upward. This is correct for a positive slope.



Example 2 Find the slope of the line that passes through $C(1, 4)$ and $D(3, -2)$.

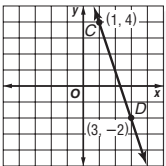
$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Definition of slope}$$

$$m = \frac{-2 - 4}{3 - 1} \quad (x_1, y_1) = (1, 4),$$

$$(x_2, y_2) = (3, -2)$$

$$m = \frac{-6}{2} \text{ or } -3 \quad \text{Simplify.}$$

Check When going from left to right, the graph of the line slants downward. This is correct for a negative slope.



Exercises

Find the slope of the line that passes through each pair of points.

1. $A(0, 1), B(3, 4)$ **1** 2. $C(1, -2), D(3, 2)$ **2** 3. $E(4, -4), F(2, 2)$ **-3**

4. $G(3, 1), H(6, 3)$ **$\frac{2}{3}$** 5. $I(4, 3), J(2, 4)$ **$-\frac{1}{2}$** 6. $K(-4, 4), L(5, 4)$ **0**

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Slope-Intercept Form

Linear equations are often written in the form $y = mx + b$. This is called the **slope-intercept form**. When an equation is written in this form, m is the slope and b is the y -intercept.

Example 1 State the slope and y -intercept of the graph of $y = x - 3$.

$$y = x - 3 \quad \text{Write the original equation.}$$

$$y = 1x + (-3) \quad \text{Write the equation in the form } y = mx + b.$$

$$y = mx + b \quad m = 1, b = -3$$

The slope of the graph is 1, and the y -intercept is -3 .

You can use the slope-intercept form of an equation to graph the equation.

Example 2 Graph $y = 2x + 1$ using the slope and y -intercept.

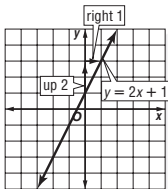
Step 1 Find the slope and y -intercept.

$$y = 2x + 1 \quad \text{slope} = 2, \text{ } y\text{-intercept} = 1.$$

Step 2 Graph the y -intercept 1.

Step 3 Write the slope 2 as $\frac{2}{1}$. Use it to locate a second point on the line.

$$m = \frac{2}{1} \leftarrow \begin{array}{l} \text{change in } y : \text{ up 2 units} \\ \text{change in } x : \text{ right 1 unit} \end{array}$$



Step 4 Draw a line through the two points.

Exercises

State the slope and y -intercept of the graph of each equation.

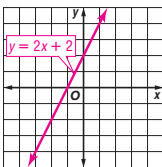
1. $y = x + 1$ **1; 1**

2. $y = 2x - 4$ **2; -4**

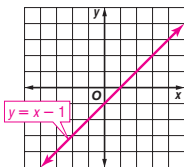
3. $y = \frac{1}{2}x - 1$ **$\frac{1}{2}; -1$**

Graph each equation using the slope and y -intercept.

4. $y = 2x + 2$



5. $y = x - 1$



6. $y = \frac{1}{2}x + 2$

