

### 2.1 Relations and Functions

State the domain and range of each relation. Then determine whether each relation is a *function*. If it is a function, determine if it is *one-to-one*, *onto*, both or *neither*.

1. Domain:  $\{2, 8\}$  Range:  $\{21, 25, 30\}$   
 $D = \{2, 8\}$   
 $R = \{21, 25, 30\}$   
 no

2. Domain:  $\{5, 10, 15\}$  Range:  $\{105, 110\}$   
 $D = \{5, 10, 15\}$   
 $R = \{105, 110\}$   
 yes  
 onto

3. 

-3	0
-1	-1
0	0
2	-2
3	4

  
 $D = \{-3, -1, 0, 2, 3\}$   
 $R = \{-2, -1, 0, 4\}$   
 yes  
 onto

4. 

-2	-1
-2	1
-1	0
1	0
2	1

  
 $D = \{-2, -1, 1, 2\}$   
 $R = \{-1, 0, 1\}$   
 no

Graph each equation and determine the domain and range. Determine whether the relation is a *function*, is *one-to-one*, *onto*, both, or *neither*. Then state whether it is *discrete* or *continuous*.

5.  $x = -1$   
  
 $D = \{-1\}$   
 $R = \{y | y \in \mathbb{R}\}$   
 no  
 cont.

6.  $y = 2x - 1$   
  
 $D = \{x | x \in \mathbb{R}\}$   
 $R = \{y | y \in \mathbb{R}\}$   
 yes  
 both  
 cont.

Find each value if  $f(x) = \frac{5}{x+2}$  and  $g(x) = -2x + 3$ .

7.  $f(3) = 1$   
 8.  $f(-4) = -\frac{5}{2}$   
 9.  $g(\frac{1}{2}) = 2$   
 10.  $f(-2)$  undef  
 11.  $g(-6) = 15$   
 12.  $f(m-2) = \frac{5}{m}$

13. **MUSIC** The ordered pairs (1, 16), (2, 16), (3, 32), (4, 32), and (5, 48) represent the cost of buying various numbers of CDs through a music club. Identify the domain and range of the relation. Is the relation discrete or continuous? Is the relation a function?  
 $D = \{1, 2, 3, 4, 5\}$ ;  $R = \{16, 32, 48\}$ ; Discrete; yes

14. **COMPUTING** If a computer can do one calculation in 0.0000000015 second, then the function  $T(n) = 0.0000000015n$  gives the time required for the computer to do  $n$  calculations. How long would it take the computer to do 5 billion calculations?  
 7.5d

### 2.2 Linear Relations and Functions

State whether each equation or function is a linear function. Write *yes* or *no*. Explain.

1.  $h(x) = 23$  yes; no variables  
 2.  $y = \frac{2}{3}x$  yes; in  $y = mx + b$  form  
 3.  $y = \frac{5}{x}$  no;  $x$  in denom.  
 4.  $9 - 5xy = 2$  no;  $x, y$  are multiplied

Write each equation in standard form. Identify  $A$ ,  $B$ , and  $C$ .

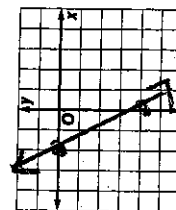
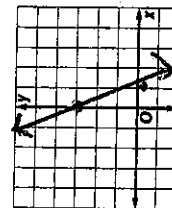
5.  $y = 7x - 5$   $7x - y = 5$ ; 7, -1, 5  
 6.  $y = \frac{3}{8}x + 5$   $3x - 8y = -40$ ; 3, -8, -40  
 7.  $3y - 5 = 0$   $3y = 5$ ; 0, 3, 5  
 8.  $x = -\frac{2}{7}y + \frac{3}{4}$   $28x + 8y = 21$ ; 28, 8, 21

Find the  $x$ -intercept and the  $y$ -intercept of the graph of each equation. Then graph the equation using the intercepts.

9.  $y = 2x + 4$  -2, 4

10.  $2x + 7y = 14$  7, 2

11.  $y = -2x - 4$  -2, -4  
 12.  $6x + 2y = 6$  1, 3



13. **MEASURE** The equation  $y = 2.54x$  gives the length  $y$  in centimeters corresponding to a length  $x$  in inches. What is the length in centimeters of a 1-foot ruler?  
 30.48 cm

14. **LONG DISTANCE** For Meg's long-distance calling plan, the monthly cost  $C$  in dollars is given by the linear function  $C(t) = 6 + 0.05t$ , where  $t$  is the number of minutes talked.

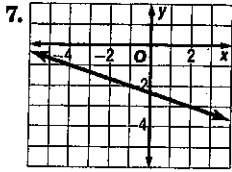
- a. What is the total cost of talking 8 hours? of talking 20 hours?  
 \$30; \$66  
 b. What is the effective cost per minute (the total cost divided by the number of minutes talked) of talking 8 hours? of talking 20 hours?  
 \$0.0625; \$0.055

## 2.3 Rate of Change and Slope

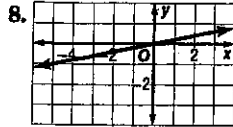
Find the slope of the line that passes through each pair of points. Express as a fraction in simplest form.

- $(3, -8), (-5, 2) = \frac{5}{4}$
- $(-10, -3), (7, 2) = \frac{5}{17}$
- $(-7, -6), (3, -6) = 0$
- $(8, 2), (8, -1) = \text{undef}$
- $(4, 3), (7, -2) = -\frac{5}{3}$
- $(-6, -3), (-8, 4) = -\frac{7}{2}$

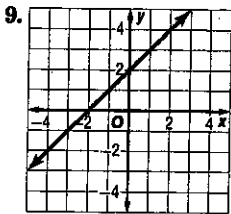
Determine the rate of change of each graph.



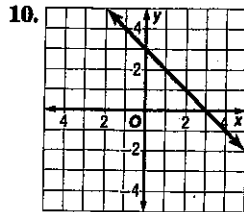
$-\frac{1}{3}$



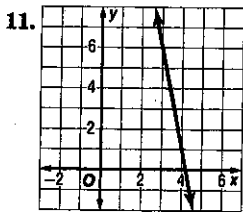
$\frac{1}{5}$



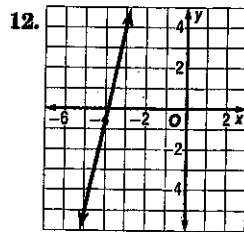
$1$



$-1$



$-5$



$\frac{2}{1}$

13. **DEPRECIATION** A machine that originally cost \$15,600 has a value of \$7500 at the end of 3 years. The same machine has a value of \$2800 at the end of 8 years.

- Find the average rate of change in value (depreciation) of the machine between its purchase and the end of 3 years.  $-\$2700/\text{yr}$
- Find the average rate of change in value of the machine between the end of 3 years and the end of 8 years.  $-\$940/\text{yr}$
- Interpret the sign of your answers.

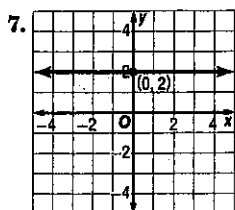
They are neg. because the value is decreasing.

## 2.4 Writing Linear Equations

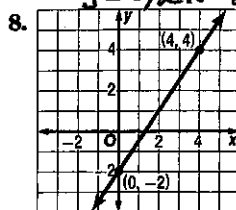
Write an equation in slope-intercept form for the line described.

- slope 2, y-intercept at 0  $y = 2x$
- parallel to  $y = 4x + 2$ , y-intercept at 4  $y = 4x + 4$
- perpendicular to  $y = \frac{1}{4}x + 2$ , passes through  $(0, 0)$   $y = -4x$
- parallel to  $y = -3x + 4$ , x-intercept at 4  $y = -3x + 12$
- perpendicular to  $y = -\frac{1}{2}x + \frac{2}{3}$ , passes through  $(2, 3)$   $y = 2x - 1$
- slope  $-\frac{2}{3}$ , x-intercept at 3  $y = -\frac{2}{3}x + 2$

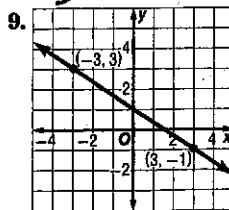
Write an equation in slope-intercept form for each graph.



$y = 2$



$y = \frac{3}{2}x - 2$



$y = -\frac{2}{3}x + 1$

Write an equation in slope-intercept form for the line that satisfies each set of conditions.

10. slope -5, passes through  $(-3, -8)$   $y = -5x - 23$

$y = \frac{4}{3}x - 11$

11. slope  $\frac{4}{5}$ , passes through  $(10, -3)$

$y = -\frac{2}{3}x - 4$

12. slope 0, passes through  $(0, -10)$   $y = -10$

$y = \frac{1}{6}x - 1$

13. slope  $-\frac{2}{3}$ , passes through  $(6, -8)$

$y = \frac{2}{3}x - 6$

14. parallel to  $y = 4x - 5$ , y-intercept at -6  $y = \frac{1}{4}x - 6$

15. slope  $\frac{1}{6}$ , x-intercept at -1  $y = -\frac{1}{4}x - 9$

19. **RESERVOIRS** The surface of Grand Lake is at an elevation of 648 feet. During the current drought, the water level is dropping at a rate of 3 inches per day. If this trend continues, write an equation that gives the elevation in feet of the surface of Grand Lake after  $x$  days.

$y = -0.25x + 648$