

State each relation as a set of ordered pairs. Then state the domain and range.

20.

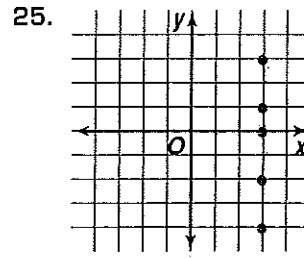
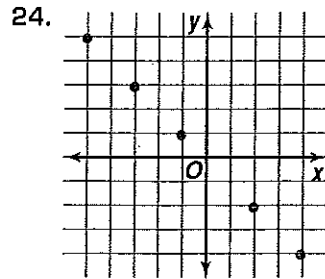
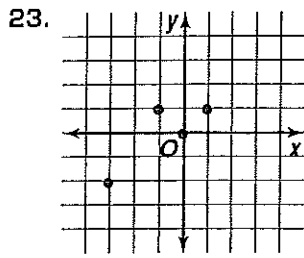
x	y
-5	-5
-3	-3
-1	-1
1	1

21.

x	y
-10	0
-5	0
0	0
5	0

22.

x	y
4	0
5	1
8	0
13	1



Given that  $x$  is an integer, state the relation representing each equation by making a table of values. Then graph the ordered pairs of the relation.

26.  $y = x - 5$  and  $-4 \leq x \leq 1$

28.  $y = |x|$  and  $-5 \leq x \leq 1$

30.  $y^2 = x - 2$  and  $x = 11$

27.  $y = -x$  and  $1 \leq x < 7$

29.  $y = 3x - 3$  and  $0 < x < 6$

31.  $|2y| = x$  and  $x = 4$

State the domain and range of each relation. Then state whether the relation is a function. Write *yes* or *no*. Explain.

32.  $\{(4, 4), (5, 4), (6, 4)\}$

34.  $\{(4, -2), (4, 2), (1, -1), (1, 1), (0, 0)\}$

36.  $\{(-1.1, -2), (-0.4, -1), (-0.1, -1)\}$

33.  $\{(1, -2), (1, 4), (1, -6), (1, 0)\}$

35.  $\{(0, 0), (2, 2), (2, -2), (5, 8), (5, -8)\}$

37.  $\{(2, -3), (9, 0), (8, -3), (-9, 8)\}$

57. **SAT Practice** What is the value of  $7^2 - (3^2 + 4^2)$ ?

A 56

B 24

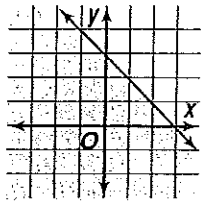
C 0

D -24

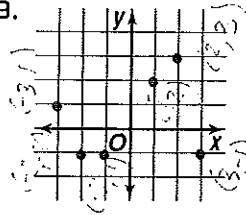
E -56

For each graph, state the domain and range of the relation. Then explain whether the graph represents a function.

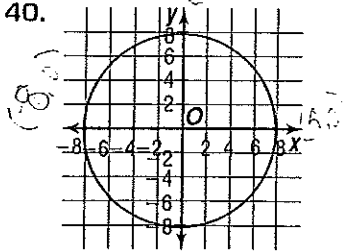
38.



39.



40.



Evaluate each function for the given value.

41.  $f(3)$  if  $f(x) = 2x + 3$

43.  $h(0.5)$  if  $h(x) = \frac{1}{x}$

45.  $f(n - 1)$  if  $f(x) = 2x^2 - x + 9$

47. Find  $f(5m)$  if  $f(x) = |x^2 - 13|$ .

42.  $g(-2)$  if  $g(x) = 5x^2 + 3x - 2$

44.  $j(2a)$  if  $j(x) = 1 - 4x^3$

46.  $g(b^2 + 1)$  if  $g(x) = \frac{3 - x}{5 + x}$

State the domain of each function.

48.  $f(x) = \frac{3x}{x^2 - 5}$

49.  $g(x) = \sqrt{x^2 - 9}$

50.  $h(x) = \frac{x + 2}{\sqrt{x^2 - 7}}$

51. You can use the table feature of a graphing calculator to find the domain of a function. Enter the function into the Y= list. Then observe the y-values in the table. An error indicates that an x-value is excluded from the domain. Determine the domain of each function.

a.  $f(x) = \frac{3}{x - 1}$

b.  $g(x) = \frac{3 - x}{5 + x}$

c.  $h(x) = \frac{x^2 - 12}{x^2 - 4}$

53. **Critical Thinking** If  $f(2m + 1) = 24m^3 + 36m^2 + 26m$ , what is  $f(x)$ ?  
(Hint: Begin by solving  $x = 2m + 1$  for  $m$ .)

54. **Aviation** The temperature of the atmosphere decreases about  $5^\circ\text{F}$  for every 1000 feet that an airplane ascends. Thus, if the ground-level temperature is  $95^\circ\text{F}$ , the temperature can be found using the function  $t(d) = 95 - 0.005d$ , where  $t(d)$  is the temperature at a height of  $d$  feet. Find the temperature outside of an airplane at each height.

- a. 500 ft      b. 750 ft      c. 1000 ft      d. 5000 ft      e. 30,000 ft

5. Given  $f(x) = 3x^2 + 4x - 5$  and  $g(x) = 2x + 9$ , find  $f(x) + g(x)$ ,  $f(x) - g(x)$ ,  $f(x) \cdot g(x)$ , and  $\left(\frac{f}{g}\right)(x)$ .

Find  $[f \circ g](x)$  and  $[g \circ f](x)$  for each  $f(x)$  and  $g(x)$ .

6.  $f(x) = 2x + 5$

$g(x) = 3 + x$

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

$g(x) = x^2 - 2x$

8. State the domain of  $[f \circ g](x)$  for  $f(x) = \frac{1}{(x-1)^2}$  and  $g(x) = x + 3$ .

Find  $f(x) + g(x)$ ,  $f(x) - g(x)$ ,  $f(x) \cdot g(x)$ , and  $\left(\frac{f}{g}\right)(x)$  for each  $f(x)$  and  $g(x)$ .

11.  $f(x) = x^2 - 2x$

$g(x) = x + 9$

12.  $f(x) = \frac{x}{x+1}$

$g(x) = x^2 - 1$

13.  $f(x) = \frac{3}{x-7}$

$g(x) = x^2 + 5x$

Find  $[f \circ g](x)$  and  $[g \circ f](x)$  for each  $f(x)$  and  $g(x)$ .

15.  $f(x) = x^2 - 9$

$g(x) = x + 4$

17.  $f(x) = x - 4$

$g(x) = 3x^2$

19.  $f(x) = 2x$

$g(x) = x^3 + x^2 + 1$

16.  $f(x) = \frac{1}{2}x - 7$

$g(x) = x + 6$

18.  $f(x) = x^2 - 1$

$g(x) = 5x^2$

20.  $f(x) = 1 + x$

$g(x) = x^2 + 5x + 6$

21. What are  $[f \circ g](x)$  and  $[g \circ f](x)$  for  $f(x) = x + 1$  and  $g(x) = \frac{1}{x-1}$ ?

State the domain of  $[f \circ g](x)$  for each  $f(x)$  and  $g(x)$ .

22.  $f(x) = 5x$   
 $g(x) = x^3$

23.  $f(x) = \frac{1}{x}$   
 $g(x) = 7 - x$

24.  $f(x) = \sqrt{x-2}$   
 $g(x) = \frac{1}{4x}$

7. Which of the following must be true?

- I. The sum of two consecutive integers is odd.
- II. The sum of three consecutive integers is even.
- III. The sum of three consecutive integers is a multiple of 3.

- A I only
- B II only
- C I and II only
- D I and III only
- E I, II, and III

8. Jose has at least one quarter, one dime, one nickel, and one penny in his pocket. If he has twice as many pennies as nickels, twice as many nickels as dimes, and twice as many dimes as quarters, then what is the least amount of money he could have in his pocket?

- A \$0.41
- B \$0.64
- C \$0.71
- D \$0.73
- E \$2.51

9. Simplify  $\frac{\frac{3}{2}}{\left(\frac{3}{2}\right)^2}$ .

- A  $\frac{27}{8}$
- B  $\frac{3}{2}$
- C  $\frac{2}{3}$
- D  $\frac{1}{2}$
- E  $\frac{1}{3}$

10. **Grid-In** At a music store, the price of a CD is three times the price of a cassette tape. If 40 CDs were sold for a total of \$480 and the combined sales of CDs and cassette tapes totaled \$600, how many cassette tapes were sold?

9. Find the first three iterates of the function  $f(x) = 2x + 1$  using the initial value  $x_0 = 2$ .

Find the first three iterates of each function using the given initial value.

25.  $f(x) = 9 - x; x_0 = 2$     26.  $f(x) = x^2 + 1; x_0 = 1$     27.  $f(x) = x(3 - x); x_0 = 1$

28. **Retail** Sara Sung is shopping and finds several items that are on sale at 25% off the original price. The items that she wishes to buy are a sweater originally at \$43.98, a pair of jeans for \$38.59, and a blouse for \$31.99. She has \$100 that her grandmother gave her for her birthday. If the sales tax in San Mateo, California, where she lives is 8.25%, does Sara have enough money for all three items? Explain.

30. **Physics** When a heavy box is being pushed on the floor, there are two different forces acting on the movement of the box. There is the force of the person pushing the box and the force of friction. If  $W$  is work in joules,  $F$  is force in newtons, and  $d$  is displacement of the box in meters,  $W_p = F_p d$  describes the work of the person, and  $W_f = F_f d$  describes the work created by friction. The increase in kinetic energy necessary to move the box is the difference between the work done by the person  $W_p$  and the work done by friction  $W_f$ .
- Write a function in simplest form for net work.
  - Determine the net work expended when a person pushes a box 50 meters with a force of 95 newtons and friction exerts a force of 55 newtons.

29. **Critical Thinking** Suppose the graphs of functions  $f(x)$  and  $g(x)$  are lines. Must it be true that the graph of  $[f \circ g](x)$  is a line? Justify your answer.

32. **Critical Thinking** Find  $f\left(\frac{1}{2}\right)$  if  $[f \circ g](x) = \frac{x^4 + x^2}{1 + x^2}$  and  $g(x) = 1 - x^2$ .

31. **Finance** A sales representative for a cosmetics supplier is paid an annual salary plus a bonus of 3% of her sales over \$275,000. Let  $f(x) = x - 275,000$  and  $h(x) = 0.03x$ .

a. If  $x$  is greater than \$275,000, is her bonus represented by  $f[h(x)]$  or by  $h[f(x)]$ ? Explain.

b. Find her bonus if her sales for the year are \$400,000.

34. **Finance** The formula for the simple interest earned on an investment is  $I = prt$ , where  $I$  is the interest earned,  $p$  is the principal,  $r$  is the interest rate, and  $t$  is the time in years. Assume that \$5000 is invested at an annual interest rate of 8% and that interest is added to the principal at the end of each year. (Lesson 1-1)

a. Find the amount of interest that will be earned each year for five years.

b. State the domain and range of the relation.

c. Is this relation a function? Why or why not?

37. Find  $g(-4)$  if  $g(x) = \frac{x^3 + 5}{4x}$ . (Lesson 1-1)

39. **SAT/ACT Practice** Find  $f(n - 1)$  if  $f(x) = 2x^2 - x + 9$ .

A  $2n^2 - n + 9$

B  $2n^2 - n + 8$

C  $2n^2 - 5n + 12$

D 9

E  $2n^2 + 4n + 8$



Graph each equation.

12.  $y = 4x - 9$

13.  $y = 3$

14.  $2x - 3y + 15 = 0$

15.  $x - 4 = 0$

16.  $y = 6x - 1$

17.  $y = 5 - 2x$

18.  $y + 8 = 0$

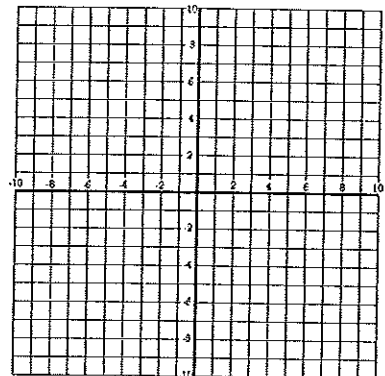
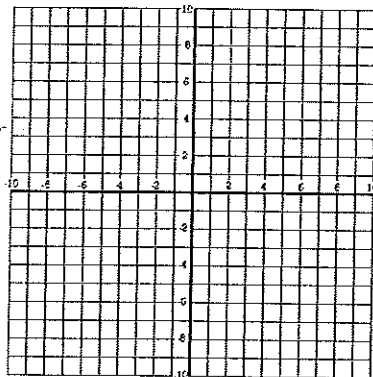
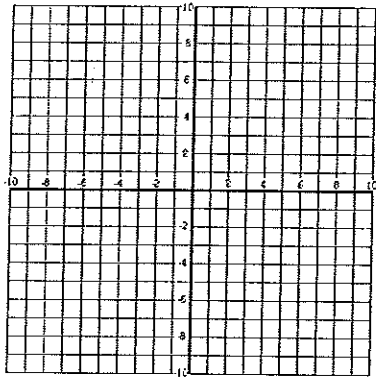
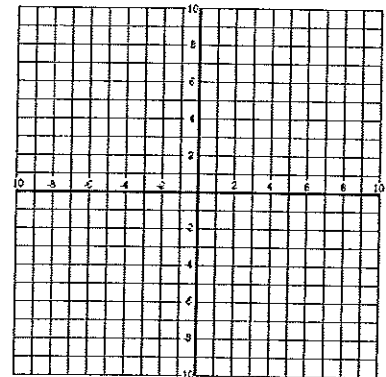
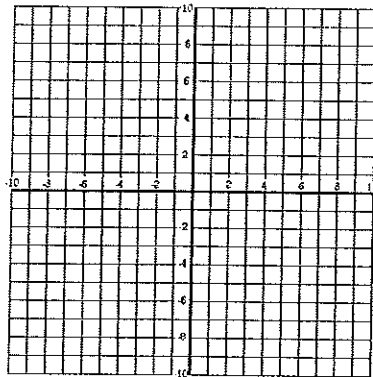
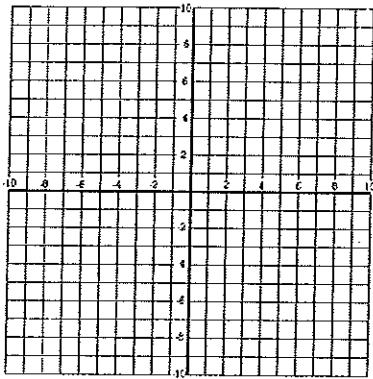
19.  $2x + y = 0$

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

21.  $y = 25x + 150$

22.  $2x + 5y = 8$

23.  $3x - y = 7$



Find the zero of each function. If no zero exists, write *none*. Then graph the function.

24.  $f(x) = 9x + 5$

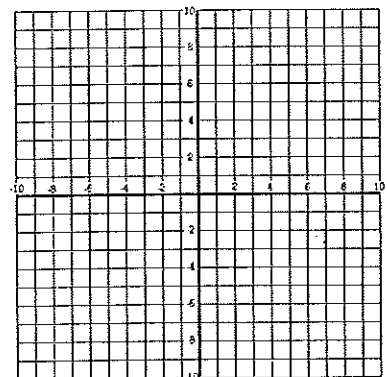
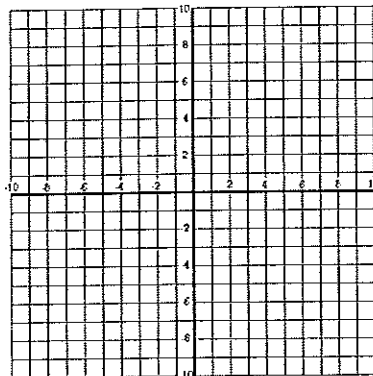
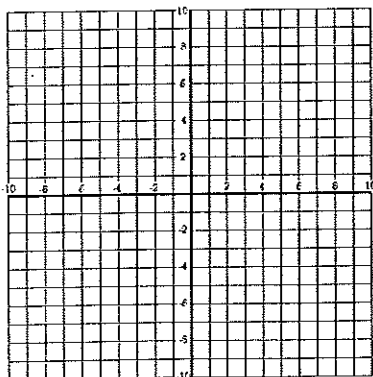
25.  $f(x) = 4x - 12$

26.  $f(x) = 3x + 1$

27.  $f(x) = 14x$

28.  $f(x) = 12$

29.  $f(x) = 5x - 8$



33. **Electronics** The voltage  $V$  in volts produced by a battery is a linear function of the current  $i$  in amperes drawn from it. The opposite of the slope of the line represents the battery's effective resistance  $R$  in ohms. For a certain battery,  $V = 12.0$  when  $i = 1.0$  and  $V = 8.4$  when  $i = 10.0$ .

- What is the effective resistance of the battery?
- Find the voltage that the battery would produce when the current is 25.0 amperes.

34. **Critical Thinking** A line passes through  $A(3, 7)$  and  $B(-4, 9)$ . Find the value of  $a$  if  $C(a, 1)$  is on the line.

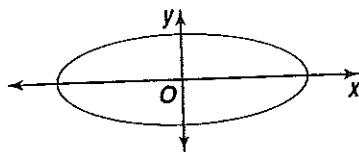
41. **Business** Computer Depot offers a 12% discount on computers sold Labor Day weekend. There is also a \$100 rebate available. (Lesson 1-2)

- Write a function for the price after the discount  $d(p)$  if  $p$  represents the original price of a computer.
- Write a function for the price after the rebate  $r(d)$  if  $d$  represents the discounted price.
- Use composition of functions to write a function to relate the selling price to the original price of a computer.
- Find the selling prices of computers with original prices of \$799.99, \$999.99, and \$1499.99.

42. Find  $[f \circ g](-3)$  and  $[g \circ f](-3)$  if  $f(x) = x^2 - 4x + 5$  and  $g(x) = x - 2$ . (Lesson 1-2)

43. Given  $f(x) = 4 + 6x - x^3$ , find  $f(9)$ . (Lesson 1-1)

44. Determine whether the graph at the right represents a function. Explain. (Lesson 1-1)

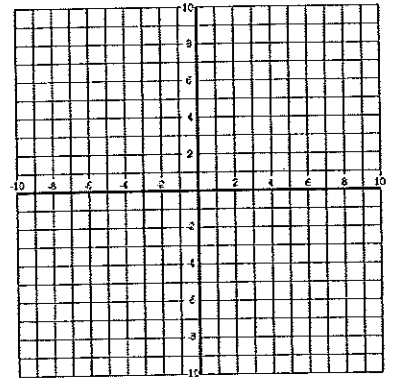


46. **SAT/ACT Practice** What is the sum of four integers whose average is 15?

- 3.75
- 15
- 30
- 60
- cannot be determined

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

11. slope = 5, y-intercept = -2
13. slope =  $-\frac{3}{4}$ , y-intercept = 0
15. passes through  $A(4, 5)$ , slope = 6
17. passes through  $A(1, 5)$  and  $B(-8, 9)$
19. passes through  $A(8, 1)$  and  $B(-3, 1)$
21. the y-axis



Write an equation in point slope form for each line described.

12. slope = 8, passes through  $(-7, 5)$
14. slope = -12, y-intercept =  $\frac{1}{2}$
16. no slope and passes through  $(12, -9)$
18. x-intercept = -8, y-intercept = 5
20. vertical and passes through  $(-4, -2)$
22. slope = 0.25, x-intercept = 24

**25. Sports** Skiers, hikers, and climbers often experience altitude sickness as they reach elevations of 8000 feet and more. A good rule of thumb for the amount of time that it takes to become acclimated to high elevations is 2 weeks for the first 7000 feet. After that, it will take 1 week more for each additional 2000 feet of altitude.

- a. Write an equation for the time  $t$  to acclimate to an altitude of  $f$  feet.
- b. Mt. Whitney in California is the highest peak in the contiguous 48 states. It is located in Eastern Sierra Nevada, on the border between Sequoia National Park and Inyo National Forest. About how many weeks would it take a person to acclimate to Mt. Whitney's elevation of 14,494 feet?

23. Line  $\ell$  passes through  $A(-2, -4)$  and has a slope of  $-\frac{1}{2}$ . What is the ~~standard~~ <sup>point-slope</sup> form of the equation for line  $\ell$ ?

24. Line  $m$  passes through  $C(-2, 0)$  and  $D(1, -3)$ . Write the equation of line  $m$  in ~~standard~~ form.

$y = mx + b$

26. **Critical Thinking** Write an expression for the slope of a line whose equation is  $Ax + By + C = 0$ .

1. If the product of  $(1 + 2)$ ,  $(2 + 3)$ , and  $(3 + 4)$  is equal to one half the sum of 20 and  $x$ , then  $x =$

A 10   B 85   C 105   D 190   E 1,210

2.  $5\frac{1}{3} - 6\frac{1}{4} = ?$

A  $-\frac{11}{12}$

B  $-\frac{1}{2}$

C  $-\frac{2}{7}$

D  $\frac{1}{2}$

E  $\frac{9}{12}$

3. Mia has a pitcher containing  $x$  ounces of root beer. If she pours  $y$  ounces of root beer into each of  $z$  glasses, how much root beer will remain in the pitcher?

A  $\frac{x}{y} + z$

B  $xy - z$

C  $\frac{x}{yz}$

D  $x - yz$

E  $\frac{x}{y} - z$

4. Which of the following is equal to 0.064?

A  $\left(\frac{1}{80}\right)^2$    B  $\left(\frac{8}{100}\right)^2$    C  $\left(\frac{1}{8}\right)^2$

D  $\left(\frac{2}{5}\right)^3$    E  $\left(\frac{8}{10}\right)^3$

5. A plumber charges \$75 for the first thirty minutes of each house call plus \$2 for each additional minute that she works. The plumber charged Mr. Adams \$113 for her time. For what amount of time, in minutes, did the plumber work?

A 38   B 44   C 49   D 59   E 64


6. If  $\frac{2+x}{5+x} = \frac{2}{5} + \frac{2}{5}$ , then  $x =$

A  $\frac{2}{5}$    B 1   C 2   D 5   E 10

State each relation as a set of ordered pairs. Then state the domain and range.

20. 

x	y
-5	-5
-3	-3
-1	-1
1	1



yes

21. 

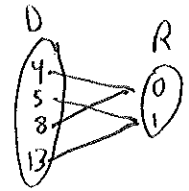
x	y
-10	0
-5	0
0	0
5	0

yes

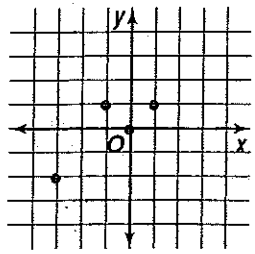
(-10, 0) (0, 0)  
(-5, 0) (5, 0)

22. 

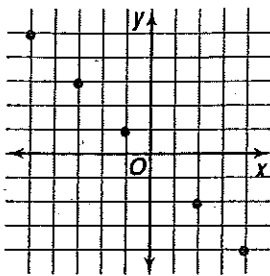
x	y
4	0
5	1
8	0
13	1



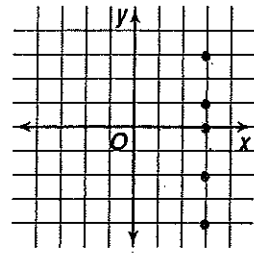
yes

23. 

yes

24. 

yes

25. 


No

Given that  $x$  is an integer, state the relation representing each equation by making a table of values. Then graph the ordered pairs of the relation.

26.  $y = x - 5$  and  $-4 \leq x \leq 1$

28.  $y = |x|$  and  $-5 \leq x \leq 1$

30.  $y^2 = x - 2$  and  $x = 11$

(30)  $y^2 = 11 - 2$   
 $y^2 = 9$   
 $y$  can be 3 or -3 

No


27.  $y = -x$  and  $1 \leq x < 7$

(29)  $y = 3x - 3$  and  $0 < x < 6$

31.  $|2y| = x$  and  $x = 4$

(29)  $y = 3x - 3$

x	y
1	0
2	3
3	6
4	9
5	12



yes

State the domain and range of each relation. Then state whether the relation is a function. Write *yes* or *no*. Explain.

32.  $\{(4, 4), (5, 4), (6, 4)\}$

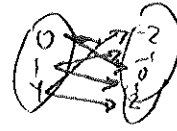
34.  $\{(4, -2), (4, 2), (1, -1), (1, 1), (0, 0)\}$

36.  $\{(-1.1, -2), (-0.4, -1), (-0.1, -1)\}$

34

D:  $\{0, 1, 4\}$

R:  $\{-2, -1, 0, 1, 2\}$



NO

36

D:  $\{-1.1, -0.4, -0.1\}$

R:  $\{-2, -1\}$

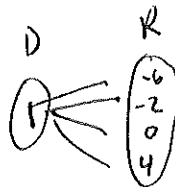
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33.  $\{(1, -2), (1, 4), (1, -6), (1, 0)\}$

35.  $\{(0, 0), (2, 2), (2, -2), (5, 8), (5, -8)\}$

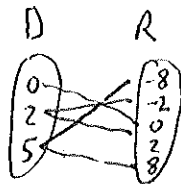
37.  $\{(2, -3), (9, 0), (8, -3), (-9, 8)\}$

33



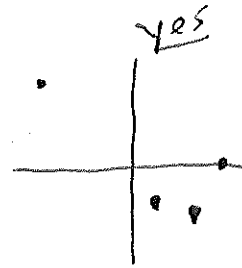
NO

35



NO

37



57. SAT Practice What is the value of  $7^2 - (3^2 + 4^2)$ ?

A 56

B 24

C 0

D -24

E -56

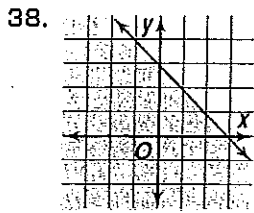
$7^2 - (9 + 16)$

$7^2 - (25)$

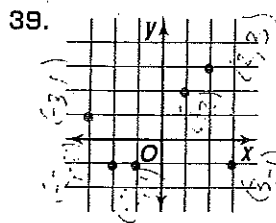
$49 - 25$

24

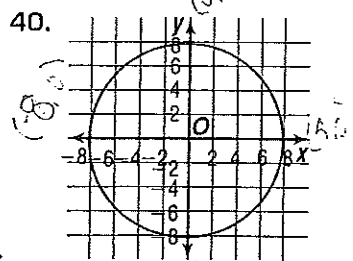
For each graph, state the domain and range of the relation. Then explain whether the graph represents a function.



$D: \{ \mathbb{R} \}$   
 $R: \{ \mathbb{R} \}$



$D: \{ -3, -2, -1, 1, 2, 3 \}$   
 $R: \{ -1, 1, 2, 3 \}$



$D: \{ x \mid -8 \leq x \leq 8 \}$   
 $R: \{ y \mid -8 \leq y \leq 8 \}$

Evaluate each function for the given value.

41.  $f(3)$  if  $f(x) = 2x + 3$

(41)  $f(3) = 2(3) + 3$   
 $f(3) = 9$

(43)  $h(.5) = \frac{1}{.5}$   
 $h(.5) = 2$

(45)  $f(n-1) = 2(n-1)^2 - (n-1)$

43.  $h(0.5)$  if  $h(x) = \frac{1}{x}$

45.  $f(n-1)$  if  $f(x) = 2x^2 - x + 9$

47. Find  $f(5m)$  if  $f(x) = |x^2 - 13|$ .

(47)  $f(5m) = |(5m)^2 - 13|$   
 $f(5m) = |25m^2 - 13|$

42.  $g(-2)$  if  $g(x) = 5x^2 + 3x - 2$

(42)  $g(-2) = 5(-2)^2 + 3(-2) - 2$   
 $20 + -6 - 2$

(44)  $j(2a) = 1 - 4(2a)^3$

44.  $j(2a)$  if  $j(x) = 1 - 4x^3$

46.  $g(b^2 + 1)$  if  $g(x) = \frac{3-x}{5+x}$

$g(-2) = 12$

(46)  $g(b^2+1) = \frac{3+(b^2+1)}{5+(b^2+1)}$

$g(b^2+1) = \frac{-b^2+2}{b^2+6}$

State the domain of each function.

48.  $f(x) = \frac{3x}{x^2 - 5}$

D:  $\{x \mid x \neq \sqrt{5}\}$

OR

D:  $\{x \mid x \neq \sqrt{5} \ \& \ x \neq -\sqrt{5}\}$

49.  $g(x) = \sqrt{x^2 - 9}$       50.  $h(x) = \frac{x+2}{\sqrt{x^2 - 7}}$

D:  $\{x \mid x \leq -3 \ \& \ x \geq 3\}$

D:  $\{x \mid x < \sqrt{7} \ \& \ x > \sqrt{7}\}$

51. You can use the table feature of a graphing calculator to find the domain of a function. Enter the function into the Y= list. Then observe the y-values in the table. An error indicates that an x-value is excluded from the domain. Determine the domain of each function.

a.  $f(x) = \frac{3}{x-1}$

D:  $\{x \mid x \neq 1\}$

b.  $g(x) = \frac{3-x}{5+x}$

D:  $\{x \mid x \neq -5\}$

c.  $h(x) = \frac{x^2 - 12}{x^2 - 4}$

D:  $\{x \mid x \neq 2 \ \& \ x \neq -2\}$

53. **Critical Thinking** If  $f(2m + 1) = 24m^3 + 36m^2 + 26m$ , what is  $f(x)$ ?  
(Hint: Begin by solving  $x = 2m + 1$  for  $m$ .)

$m = \frac{x-1}{2}$

$f(x) = 3x^3 + 4x - \frac{10}{7}$

54. **Aviation** The temperature of the atmosphere decreases about 5°F for every 1000 feet that an airplane ascends. Thus, if the ground-level temperature is 95°F, the temperature can be found using the function  $t(d) = 95 - 0.005d$ , where  $t(d)$  is the temperature at a height of  $d$  feet. Find the temperature outside of an airplane at each height.

- a. 500 ft      b. 750 ft      c. 1000 ft      d. 5000 ft      e. 30,000 ft

$t(500) = 95 - 0.005(500)$

$t(500) = 92.5^\circ$

$t(1000) = 95 - 0.005(1000)$

$t(1000) = 90^\circ$

$t(30,000) = 95 - 0.005(30,000)$

$t(30,000) = -5^\circ$

$t(750) = 95 - 0.005(750)$

$t(750) = 91.25^\circ$

$t(5000) = 95 - 0.005(5000)$

$t(5000) = 70^\circ$



5. Given  $f(x) = 3x^2 + 4x - 5$  and  $g(x) = 2x + 9$ , find  $f(x) + g(x)$ ,  $f(x) - g(x)$ ,

$f(x) \cdot g(x)$ , and  $\left(\frac{f}{g}\right)(x)$ .

$$f(x) + g(x) = (3x^2 + 4x - 5) + (2x + 9) = 3x^2 + 6x + 4$$

$$f(x) - g(x) = (3x^2 + 4x - 5) - (2x + 9) = 3x^2 - 2x - 14$$

$$f(x) \cdot g(x) = (3x^2 + 4x - 5)(2x + 9)$$

$$\frac{f(x)}{g(x)} = \frac{3x^2 + 4x - 5}{2x + 9}$$

Find  $[f \circ g](x)$  and  $[g \circ f](x)$  for each  $f(x)$  and  $g(x)$ .

6.  $f(x) = 2x + 5$

$g(x) = 3 + x$

$f(g(x)) = 2(3+x) + 5$

$g(f(x)) = 3 + (2x+5)$

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

$g(x) = x^2 - 2x$

$f(g(x)) = 2(x^2 - 2x) - 3$

$g(f(x)) = (2x-3)^2 - 2(2x-3)$

8. State the domain of  $[f \circ g](x)$  for  $f(x) = \frac{1}{(x-1)^2}$  and  $g(x) = x + 3$ .

$$f(g(x)) = \frac{1}{[(x+3)-1]^2}$$

D:  $\{x \mid x \neq -2\}$

Find  $f(x) + g(x)$ ,  $f(x) - g(x)$ ,  $f(x) \cdot g(x)$ , and  $\left(\frac{f}{g}\right)(x)$  for each  $f(x)$  and  $g(x)$ .

11.  $f(x) = x^2 - 2x$

$g(x) = x + 9$

$f(x) + g(x) = (x^2 - 2x) + (x + 9)$

$f(x) - g(x) = (x^2 - 2x) - (x + 9) = x^2 - 3x - 9$

$f(x) \cdot g(x) = (x^2 - 2x)(x + 9)$

$\left(\frac{f}{g}\right)(x) = \frac{x^2 - 2x}{x + 9}$

12.  $f(x) = \frac{x}{x+1}$

$g(x) = x^2 - 1$

$f(x) + g(x) = \left(\frac{x}{x+1}\right) + (x^2 - 1)$

$f(x) - g(x) = \left(\frac{x}{x+1}\right) - (x^2 - 1)$

$f(x) \cdot g(x) = \left(\frac{x}{x+1}\right)(x^2 - 1)$

$\left(\frac{f}{g}\right)(x) = \frac{x/x+1}{x^2-1}$

13.  $f(x) = \frac{3}{x-7}$

$g(x) = x^2 + 5x$

$f(x) + g(x) = \frac{3}{x-7} + x^2 + 5x$

$f(x) - g(x) = \frac{3}{x-7} - x^2 - 5x$

$f(x) \cdot g(x) = \left(\frac{3}{x-7}\right)(x^2 + 5x)$

$\left(\frac{f}{g}\right)(x) = \frac{3/x-7}{x^2+5x}$

Find  $[f \circ g](x)$  and  $[g \circ f](x)$  for each  $f(x)$  and  $g(x)$ .

15.  $f(x) = x^2 - 9$

$g(x) = x + 4$

$f(g(x)) = (x+4)^2 - 9$

$g(f(x)) = (x^2 - 9) + 4$

17.  $f(x) = x - 4$

$g(x) = 3x^2$

$f(g(x)) = 3x^2 - 4$

$g(f(x)) = 3(x-4)^2$

19.  $f(x) = 2x$

$g(x) = x^3 + x^2 + 1$

$f(g(x)) = 2(x^3 + x^2 + 1)$

$g(f(x)) = (2x)^3 + (2x)^2 + 1$

16.  $f(x) = \frac{1}{2}x - 7$

$g(x) = x + 6$

$f(g(x)) = \frac{1}{2}(x+6) - 7$

$g(f(x)) = \left(\frac{1}{2}x - 7\right) + 6$

18.  $f(x) = x^2 - 1$

$g(x) = 5x^2$

$f(g(x)) = (5x^2)^2 - 1$

$g(f(x)) = 5(x^2 - 1)^2$

20.  $f(x) = 1 + x$

$g(x) = x^2 + 5x + 6$

$f(g(x)) = 1 + (x^2 + 5x + 6)$

$g(f(x)) = (1+x)^2 + 5(1+x) + 6$

21. What are  $[f \circ g](x)$  and  $[g \circ f](x)$  for  $f(x) = x + 1$  and  $g(x) = \frac{1}{x-1}$ ?

$$f(g(x)) = \left(\frac{1}{x-1}\right) + 1$$

$$g(f(x)) = \frac{1}{(x+1)-1}$$

State the domain of  $[f \circ g](x)$  for each  $f(x)$  and  $g(x)$ .

22.  $f(x) = 5x$

$g(x) = x^3$

$f(g(x)) = 5(x^3)$

~~Domain~~

D:  $\{ \mathbb{R} \}$

23.  $f(x) = \frac{1}{x}$

$g(x) = 7 - x$

$f(g(x)) = \frac{1}{7-x}$

D:  $\{ x \mid x \neq 7 \}$

24.  $f(x) = \sqrt{x-2}$

$g(x) = \frac{1}{4x}$

$f(g(x)) = \sqrt{\frac{1}{4x} - 2}$

~~Domain~~

D:  $\{ x \mid 0 < x \leq \frac{1}{8} \}$

7. Which of the following must be true?

- I. The sum of two consecutive integers is odd.
  - II. The sum of three consecutive integers is even.
  - III. The sum of three consecutive integers is a multiple of 3.
- A I only  
 B II only  
 C I and II only  
 D I and III only  
 E I, II, and III

8. Jose has at least one quarter, one dime, one nickel, and one penny in his pocket. If he has twice as many pennies as nickels, twice as many nickels as dimes, and twice as many dimes as quarters, then what is the least amount of money he could have in his pocket?

- A \$0.41      B \$0.64      C \$0.71  
 D \$0.73      E \$2.51

9. Simplify  $\frac{\frac{3}{2}}{\left(\frac{3}{2}\right)^2} = \frac{\frac{3}{2}}{\frac{9}{4}} = \frac{3}{2} \cdot \frac{4}{9} = \frac{12}{18} = \frac{2}{3}$

- A  $\frac{27}{8}$   
 B  $\frac{3}{2}$   
 C  $\frac{2}{3}$   
 D  $\frac{1}{2}$   
 E  $\frac{1}{3}$

10. **Grid-In** At a music store, the price of a CD is three times the price of a cassette tape. If 40 CDs were sold for a total of \$480 and the combined sales of CDs and cassette tapes totaled \$600, how many cassette tapes were sold?

$\frac{\$480}{40} = \$12/\text{CD}$

$\frac{\$600}{120} = \$5$

$\frac{\$12}{3} = \$4/\text{cassette}$

$\frac{120}{\$4} = 30$  cassettes were sold.



9. Find the first three iterates of the function  $f(x) = 2x + 1$  using the initial value  $x_0 = 2$ .

$$\textcircled{1} f(2) = 2(2) + 1 = 5$$

$$\textcircled{2} f(5) = 2(5) + 1 = 11$$

$$\textcircled{3} f(11) = 2(11) + 1 = 23$$

Find the first three iterates of each function using the given initial value.

$$25. f(x) = 9 - x; x_0 = 2$$

$$\textcircled{1} f(2) = 9 - 2 = 7$$

$$\textcircled{2} f(7) = 9 - 7 = 2$$

$$\textcircled{3} f(2) = 9 - 2 = 7$$

$$26. f(x) = x^2 + 1; x_0 = 1$$

$$\textcircled{1} f(1) = 1^2 + 1 = 2$$

$$\textcircled{2} f(2) = 2^2 + 1 = 5$$

$$\textcircled{3} f(5) = 5^2 + 1 = 26$$

$$27. f(x) = x(3 - x); x_0 = 1$$

$$\textcircled{1} f(1) = 1(3 - 1) = 2$$

$$\textcircled{2} f(2) = 2(3 - 2) = 2$$

$$\textcircled{3} f(2) = 2(3 - 2) = 2$$

28. **Retail** Sara Sung is shopping and finds several items that are on sale at 25% off the original price. The items that she wishes to buy are a sweater originally at \$43.98, a pair of jeans for \$38.59, and a blouse for \$31.99. She has \$100 that her grandmother gave her for her birthday. If the sales tax in San Mateo, California, where she lives is 8.25%, does Sara have enough money for all three items?

Explain.

$$43.98$$

$$+ 38.59$$

$$+ 31.99$$

$$\hline 114.56$$

$$114.56 \cdot .75 = 85.92 \cdot 1.0825 = \$93.01$$

$\therefore$  yes, she will stay under her \$100 budget

30. **Physics** When a heavy box is being pushed on the floor, there are two different forces acting on the movement of the box. There is the force of the person pushing the box and the force of friction. If  $W$  is work in joules,  $F$  is force in newtons, and  $d$  is displacement of the box in meters,  $W_p = F_p d$  describes the work of the person, and  $W_f = F_f d$  describes the work created by friction. The increase in kinetic energy necessary to move the box is the difference between the work done by the person  $W_p$  and the work done by friction  $W_f$ .

a. Write a function in simplest form for net work.  $K: W_p - W_f = F_p d - F_f d$

b. Determine the net work expended when a person pushes a box 50 meters with a force of 95 newtons and friction exerts a force of 55 newtons.

$$K = W_p - W_f = 95_N \cdot 50_m - 55_N \cdot 50_m$$

$$= 4750 - 2750$$

$$= 2000 \text{ N}\cdot\text{m}$$

29. **Critical Thinking** Suppose the graphs of functions  $f(x)$  and  $g(x)$  are lines. Must it be true that the graph of  $[f \circ g](x)$  is a line? Justify your answer.

~~no~~ yes,  $y = mx + b$  as an ex.

32. **Critical Thinking** Find  $f\left(\frac{1}{2}\right)$  if  $[f \circ g](x) = \frac{x^4 + x^2}{1 + x^2}$  and  $g(x) = 1 - x^2$ .

$$f(g(x)) = \frac{1}{2}$$

31. **Finance** A sales representative for a cosmetics supplier is paid an annual salary plus a bonus of 3% of her sales over \$275,000. Let  $f(x) = x - 275,000$  and  $h(x) = 0.03x$ .

- a. If  $x$  is greater than \$275,000, is her bonus represented by  $f[h(x)]$  or by  $h[f(x)]$ ? Explain.  $.03(x - 275,000)$
- b. Find her bonus if her sales for the year are \$400,000.

$$h(f(400000)) = 3,750$$

34. **Finance** The formula for the simple interest earned on an investment is  $I = prt$ , where  $I$  is the interest earned,  $p$  is the principal,  $r$  is the interest rate, and  $t$  is the time in years. Assume that \$5000 is invested at an annual interest rate of 8% and that interest is added to the principal at the end of each year. (Lesson 1-1)

- a. Find the amount of interest that will be earned each year for five years.  
 b. State the domain and range of the relation.  
 c. Is this relation a function? Why or why not?

$$I_1 = 5000 \cdot .08 \cdot 1 = 400$$

$$I_2 = 5400 \cdot .08 \cdot 1 = 432$$

$$I_3 = 5832 \cdot .08 \cdot 1 = 466.56$$

$$I_4 = 6298.56 \cdot .08 \cdot 1 = 503.88$$

$$I_5 = 6802.44 \cdot .08 \cdot 1 = 544.20$$

$$D: \{1, 2, 3, 4, 5\}$$

$$R: \{400, 432, 466.56, 503.88, 544.20\}$$

37. Find  $g(-4)$  if  $g(x) = \frac{x^3 + 5}{4x}$ . (Lesson 1-1)

39. **SAT/ACT Practice** Find  $f(n - 1)$  if  $f(x) = 2x^2 - x + 9$ .

A  $2n^2 - n + 9$

B  $2n^2 - n + 8$

**C**  $2n^2 - 5n + 12$

D 9

E  $2n^2 + 4n + 8$

1-2 B #33

$$\frac{x^2(x^2+1)}{(x^2+1)} = x^2$$

$$f\left(\frac{1}{2}\right) \text{ if } f(g(x)) = \frac{x^4+1}{1+x^2} \quad \times$$

$$f(1-x^2) = \frac{x^4+x^2}{1+x^2} \quad g(x) = 1-x^2$$

$$\begin{aligned} n &= 1-x^2 \\ n-1 &= -x^2 \\ 1-n &= x^2 \\ \sqrt{1-n} &= x \end{aligned}$$

$$f(1-(\sqrt{1-n})^2) = \frac{(\sqrt{1-n})^4 + (\sqrt{1-n})^2}{1 + (\sqrt{1-n})^2}$$

$$f(n) = \frac{(1-n)^2 + 1-n}{1 + 1-n}$$

$$f(n) = \frac{1-2n+n^2+1-n}{2-n}$$

$$f(n) = \frac{2-3n+n^2}{2-n}$$

$$f\left(\frac{1}{2}\right) = \frac{2-3\left(\frac{1}{2}\right)+\left(\frac{1}{2}\right)^2}{2-\frac{1}{2}} = \frac{\frac{3}{4}}{\frac{3}{2}}$$

$$\frac{3}{4} - \frac{3}{4} + \frac{1}{4} = \frac{1}{4}$$

$$\frac{3}{2}$$

$$\frac{3}{4} \cdot \frac{2}{3} = \frac{2}{4} = \frac{1}{2}$$

$$f\left(\frac{1}{2}\right) = \frac{1}{2}$$

Graph each equation.

12.  $y = 4x - 9$

13.  $y = 3$

14.  $2x - 3y + 15 = 0$

15.  $x - 4 = 0$

16.  $y = 6x - 1$

17.  $y = 5 - 2x$

18.  $y + 8 = 0$

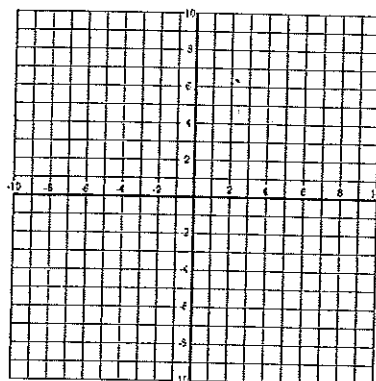
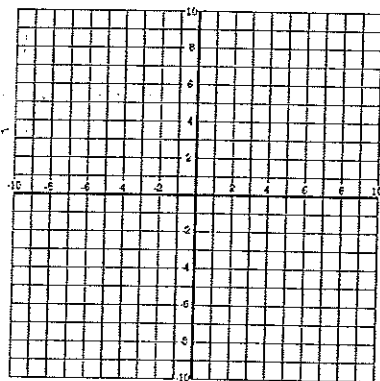
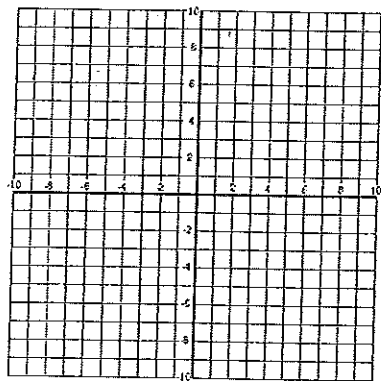
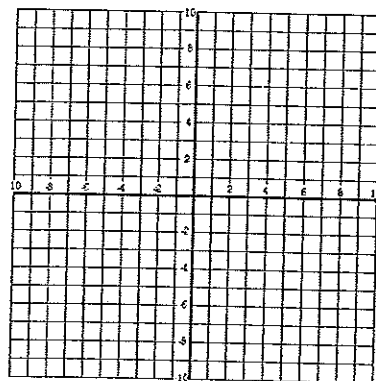
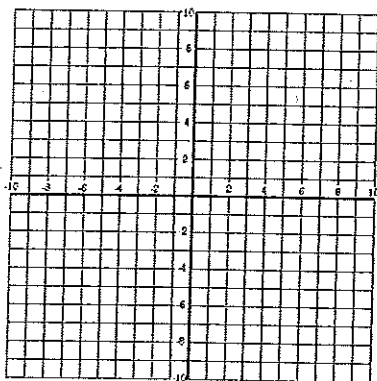
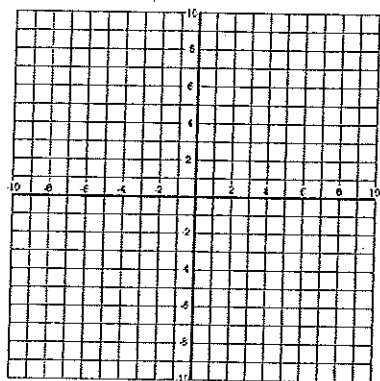
19.  $2x + y = 0$

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

21.  $y = 25x + 150$

22.  $2x + 5y = 8$

23.  $3x - y = 7$



Find the zero of each function. If no zero exists, write *none*. Then graph the function.

24.  $f(x) = 9x + 5$

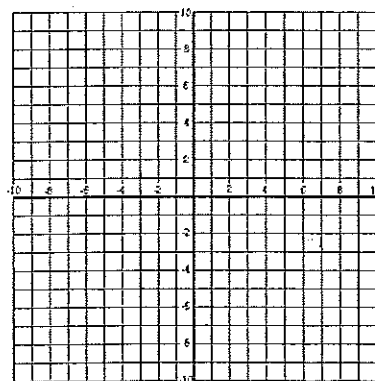
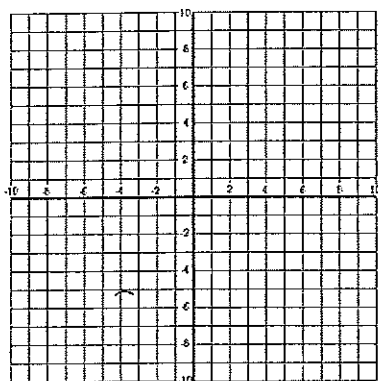
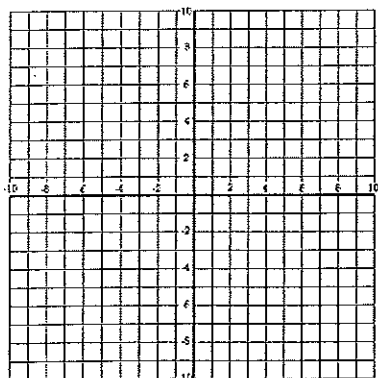
25.  $f(x) = 4x - 12$

26.  $f(x) = 3x + 1$

27.  $f(x) = 14x$

28.  $f(x) = 12$

29.  $f(x) = 5x - 8$



33. **Electronics** The voltage  $V$  in volts produced by a battery is a linear function of the current  $i$  in amperes drawn from it. The opposite of the slope of the line represents the battery's effective resistance  $R$  in ohms. For a certain battery,  $V = 12.0$  when  $i = 1.0$  and  $V = 8.4$  when  $i = 10.0$ .

(y)	(x)
V	i
12	1
8.4	10

- What is the effective resistance of the battery?  $2.5$
- Find the voltage that the battery would produce when the current is 25.0 amperes.

$$V = -2.5i + 14.5$$

$$V = -2.5(25) + 14.5$$

$$V = -4.8$$

$$m = \frac{10-1}{8.4-12} = \frac{9}{-3.6} = -\frac{5}{2} \text{ or } -2.5$$

$$V = -2.5i + b$$

$$12 = -2.5(1) + b$$

$$14.5 = b$$

34. **Critical Thinking** A line passes through  $A(3, 7)$  and  $B(-4, 9)$ . Find the value of  $a$  if  $C(a, 1)$  is on the line.

$$\frac{9-7}{-4-3} = \frac{2}{-7}$$

x	y
-4	9
3	7
10	5
17	3
24	1

$$a = 24$$

41. **Business** Computer Depot offers a 12% discount on computers sold Labor Day weekend. There is also a \$100 rebate available. (Lesson 1-2)

- Write a function for the price after the discount  $d(p)$  if  $p$  represents the original price of a computer.
- Write a function for the price after the rebate  $r(d)$  if  $d$  represents the discounted price.
- Use composition of functions to write a function to relate the selling price to the original price of a computer.
- Find the selling prices of computers with original prices of \$799.99, \$999.99, and \$1499.99.

$$d(p) = .88p$$

$$r(d) = d - 100$$

~~$$r(d(p)) = .88p - 100$$~~

$$r(d(p)) = .88p - 100$$

$$\downarrow$$

$$1219.99$$

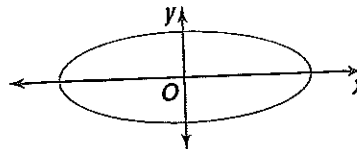
$$\downarrow \quad \downarrow$$

$$603.99 \quad 779.99$$

42. Find  $[f \circ g](-3)$  and  $[g \circ f](-3)$  if  $f(x) = x^2 - 4x + 5$  and  $g(x) = x - 2$ . (Lesson 1-2)

43. Given  $f(x) = 4 + 6x - x^3$ , find  $f(9)$ . (Lesson 1-1)

44. Determine whether the graph at the right represents a function. Explain. (Lesson 1-1)



46. **SAT/ACT Practice** What is the sum of four integers whose average is 15?

- 3.75
- 15
- 30
- 60
- cannot be determined

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

11. slope = 5, y-intercept = -2  $y = 5x - 2$

13. slope =  $-\frac{3}{4}$ , y-intercept = 0  $y = -\frac{3}{4}x$

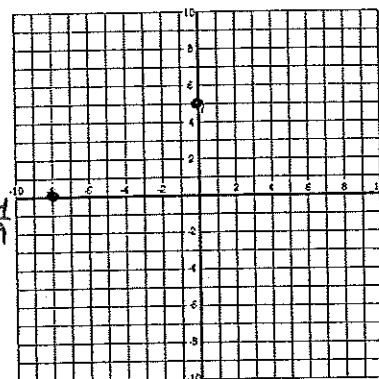
15. passes through A(4, 5), slope = 6  $5 = 6(4) + b$   
 $\frac{-24 - 24}{-79} = 6$   $y = 6x - 19$

17. passes through A(1, 5) and B(-8, 9)  $\frac{9 - 5}{-8 - 1} = \frac{4}{-9}$   $y = -\frac{4}{9}(x) + 6$

19. passes through A(8, 1) and B(-3, 1)  $\frac{1 - 1}{8 - (-3)} = \frac{0}{11}$   $y = 1$

21. the y-axis  $x = 0$

$y = -\frac{4}{9}x + 5\frac{4}{9}$



Write an equation in point slope form for each line described.

12. slope = 8, passes through (-7, 5)  $y - 5 = 8(x + 7)$

14. slope = -12, y-intercept =  $\frac{1}{2}$   $(0, \frac{1}{2})$   $y - \frac{1}{2} = -12(x - 0)$

16. no slope and passes through (12, -9)  $x = 12$

18. x-intercept = -8, y-intercept = 5 on grid  $y = \frac{5}{8}x + 5$

20. vertical and passes through (-4, -2)  $x = -2$

22. slope = 0.25, x-intercept = 24

$(24, 0)$   $y - 0 = .25(x - 24)$

25. **Sports** Skiers, hikers, and climbers often experience altitude sickness as they reach elevations of 8000 feet and more. A good rule of thumb for the amount of time that it takes to become acclimated to high elevations is 2 weeks for the first 7000 feet. After that, it will take 1 week more for each additional 2000 feet of altitude.

a. Write an equation for the time  $t$  to acclimate to an altitude of  $f$  feet.

b. Mt. Whitney in California is the highest peak in the contiguous 48 states. It is located in Eastern Sierra Nevada, on the border between Sequoia National Park and Inyo National Forest. About how many weeks would it take a person to acclimate to Mt. Whitney's elevation of 14,494 feet?

$t$   $f$   
 (2, 7000)  
 (3, 9000)

$m = 2000$   
 $f = 2000t + 3000$

~~$t = \frac{f - 3000}{2000}$~~   $t = \frac{14494 - 3000}{2000}$

$14494 = 2000t + 3000$   
 $-3000 \quad -3000$   
 $\frac{11494}{2000} = \frac{2000t}{2000}$

5.747

$\frac{f - 3000}{2000} = \frac{2000t}{2000}$

$\frac{f}{2000} - 1.5 = t$

or

$t = \frac{1}{2000}f - 1.5$



23. Line  $\ell$  passes through  $A(-2, -4)$  and has a slope of  $-\frac{1}{2}$ . What is the <sup>point-slope</sup> ~~standard~~ form of the equation for line  $\ell$ ?

$$y + 4 = -\frac{1}{2}(x + 2)$$

24. Line  $m$  passes through  $C(-2, 0)$  and  $D(1, -3)$ . Write the equation of line  $m$  in ~~standard~~ form.

$n = mx + b$

$$\frac{-3 - 0}{1 - (-2)} = \frac{-3}{3} = -1$$

$$\begin{aligned} -3 &= -1(1) + b \\ -3 &= -1 + b \\ \frac{-1 + 1}{-2} &= b \\ -2 &= b \end{aligned}$$

$$y = -1x - 2$$

26. **Critical Thinking** Write an expression for the slope of a line whose equation is  $Ax + By + C = 0$ .

$$\frac{By}{B} = \frac{-Ax - C}{B}$$

↑  
slope

1. If the product of  $(1 + 2)$ ,  $(2 + 3)$ , and  $(3 + 4)$  is equal to one half the sum of 20 and  $x$ , then  $x =$

- A 10   B 85   C 105   **D 190**   E 1,210

2.  $5\frac{1}{3} - 6\frac{1}{4} = ?$

- A**  $-\frac{11}{12}$   
B  $-\frac{1}{2}$   
C  $-\frac{2}{7}$   
D  $\frac{1}{2}$   
E  $\frac{9}{12}$

$$\begin{aligned} 3 \cdot 5 \cdot 7 &= \frac{1}{2}(20 + x) \\ 105 &= 10 + \frac{1}{2}x \\ 95 &= \frac{1}{2}x \\ \frac{1}{2} \cdot \frac{1}{2} & \\ 190 &= x \end{aligned}$$

3. Mia has a pitcher containing  $x$  ounces of root beer. If she pours  $y$  ounces of root beer into each of  $z$  glasses, how much root beer will remain in the pitcher?

- A  $\frac{x}{y} + z$   
B  $xy - z$   
C  $\frac{x}{yz}$   
**D**  $x - yz$   
E  $\frac{x}{y} - z$

$$\begin{aligned} 50 - 3 \cdot 5 \\ x - yz \end{aligned}$$

4. Which of the following is equal to 0.064?

- A  $(\frac{1}{80})^2$    **B**  $(\frac{8}{100})^2$    C  $(\frac{1}{8})^2$   
**D**  $(\frac{2}{5})^3$    E  $(\frac{8}{10})^3$

5. A plumber charges \$75 for the first thirty minutes of each house call plus \$2 for each additional minute that she works. The plumber charged Mr. Adams \$113 for her time. For what amount of time, in minutes, did the plumber work?

- A 38   B 44   **C 49**   D 59   E 64
- $\frac{113}{-75} = 38$   
 $\frac{38}{2} = 19$   
 $19 + 30 = 49$

6. If  $\frac{2+x}{5} = \frac{4}{5}$ , then  $x =$

- A  $\frac{2}{5}$    B 1   C 2   D 5   **E 10**

$$10 + 5x = 10 + 2x$$

$$\frac{2+x}{5+x} = \frac{4}{5}$$

$$\begin{aligned} 4(5+x) &= 5(2+x) \\ 20 + 4x &= 10 + 5x \\ 10 &= x \end{aligned}$$