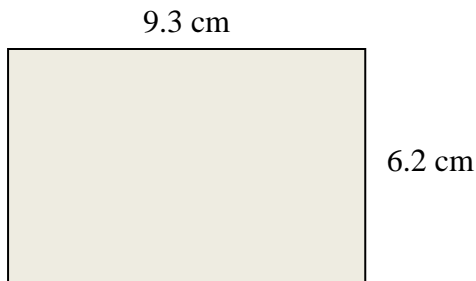


1. Use the diagram below.



A rectangle's sides are measured to be 6.2 cm and 9.3 cm. What is the rectangle's area rounded to the correct number of significant digits?

- (A)  $57.66 \text{ cm}^2$   
(B)  $57.7 \text{ cm}^2$   
(C)  $58 \text{ cm}^2$   
(D)  $60 \text{ cm}^2$
2. In the formula  $F = I + at$ ,  $F$  and  $I$  are measured in meters per second and  $t$  is measured in seconds. In what units is  $a$  measured?
- (A) meters  
(B) seconds  
(C) meters per second  
(D) meters per second squared
3. Some fire extinguishers contain pressurized water. The water pressure should be 162.5 psi (pounds per square inch), but it is acceptable for the pressure to differ from this value by at most 12.5 psi. Write and solve an absolute-value inequality to find the range of acceptable pressures.
- (A)  $|p - 12.5| \leq 162.5$   
 $-150.0 \leq p \leq 175.0$   
(B)  $|p - 12.5| \leq 162.5$   
 $p \leq -150.0$  or  $p \geq 175.0$   
(C)  $|p - 162.5| \leq 12.5$   
 $p \leq 150.0$  or  $p \geq 175.0$   
(D)  $|p - 162.5| \leq 12.5$   
 $150.0 \leq p \leq 175.0$

For questions 4 and 5, use the solution to the equation  $2x - 3 = 11$  below.

Start:  $2x - 3 = 11$

Step 1:  $2x - 3 + 3 = 11 + 3$

Step 2:  $2x = 14$

Step 3:  $\frac{1}{2}(2x) = \frac{1}{2}(14)$

Step 4:  $x = 7$

4. In Step 1, the addition property of equality was applied.

- (A) True
- (B) False

5. In Step 3, the symmetric property of equality was applied.

- (A) True
- (B) False

---

6. Tim was asked to solve the equation  $kx = my - mx$  for  $x$ . His solution is shown below.

Start:  $kx = my - mx$

Step 1:  $kx + mx = my$

Step 2:  $x(k + m) = my$

Step 3:  $x = \frac{my}{k + m}$

In which step did Tim make his first mistake when solving the equation?

- (A) Step 1
- (B) Step 2
- (C) Step 3
- (D) Tim did not make a mistake.

7. The potential energy  $P$  of an object relative to the ground is equal to the product of its mass  $m$ , the acceleration due to gravity  $g$ , and its height above the ground  $h$ .

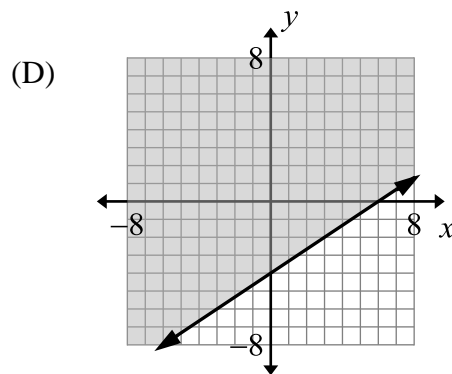
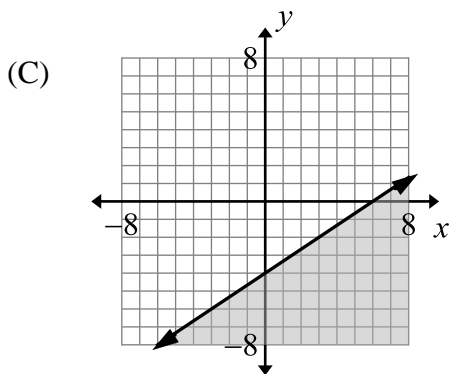
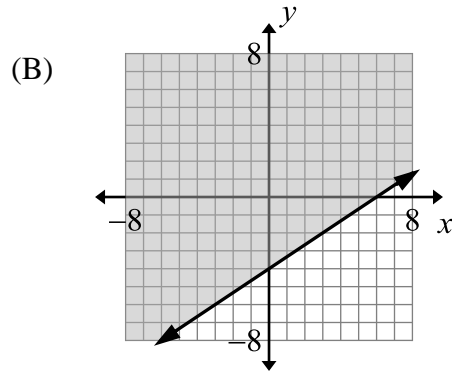
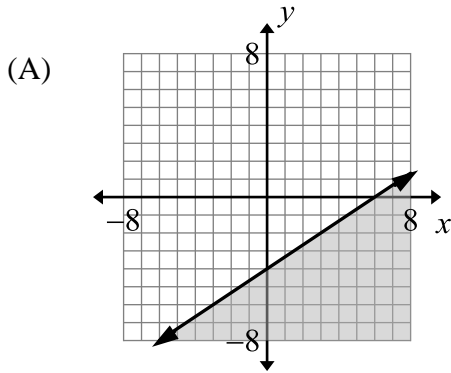
$$P = mgh$$

Solve the formula for height  $h$ .

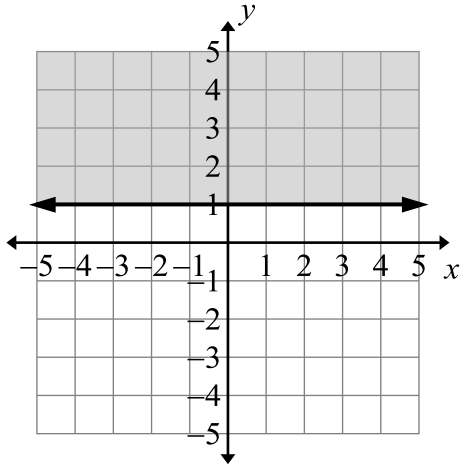
- (A)  $h = \frac{P}{mg}$
- (B)  $h = \frac{mg}{P}$
- (C)  $h = Pmg$
- (D)  $h = P - mg$
8. An internet business sells U.S. flags for \$16.95 each, plus \$2.50 shipping per flag. Shipping is free, however, on orders where more than \$100.00 of flags are purchased. Which correctly shows the number of flags  $f$  that must be purchased to get free shipping?
- (A)  $16.95f = 100$
- (B)  $16.95f > 100$
- (C)  $19.45f > 100$
- (D)  $16.95f + 2.50 > 100$
9. An athlete works out each day for 60 minutes, of which  $t$  minutes is spent running at  $0.20 \frac{\text{mi}}{\text{min}}$ , and the rest of the time is spent walking at  $0.05 \frac{\text{mi}}{\text{min}}$ . Which expression represents the total distance the athlete travels in miles while working out each day?
- (A)  $(0.25)(60)$
- (B)  $0.25t + (60 - t)$
- (C)  $0.20t + 0.05(60 - t)$
- (D)  $(0.20)(0.05) + t(60 - t)$

10. What are the coefficients in the expression  $3x - 4y + 2$ ?
- (A)  $3x$ ,  $-4y$ , and  $2$   
(B)  $3$  and  $-4$   
(C)  $x$  and  $y$   
(D)  $2$
11. In the formula  $v = \frac{x_f - x_0}{t}$ ,  $x_f$  and  $x_0$  are both measured in feet and  $t$  is measured in seconds.
- (a) In what units is  $v$  measured?  
(b) Let  $x_0 = 3,300$  ft. Convert  $x_0$  to miles. (1 mile = 5280 feet)  
(c) Solve the formula for  $x_f$ .
12. Let the price of a meal at a restaurant be  $p$ . The tax and tip on the meal are generally a percentage of the meal's price. The total cost of the meal is its price plus tax plus tip.
- (a) Write an expression for the total cost of a meal where the tax is 8% and the tip is 15%.  
(b) Write an expression for the total cost of a meal where the tax is  $x\%$  and the tip is  $g\%$ .  
(c) David calculates a 15% tip by dividing the meal price by 10, dividing that number by 2, and then adding the two numbers, i.e.  $\text{tip} = \frac{p}{10} + \frac{\left(\frac{p}{10}\right)}{2}$ . Explain whether or not this method is correct.
13. Justin plans to spend \$20 on sports cards. Regular cards cost \$3.50 per pack and foil cards cost \$4.50 per pack. Which inequality shows the relationship between the number of packs of regular cards ( $r$ ) and the number of packs of foil cards ( $f$ ) Justin can afford to buy?
- (A)  $3.5f + 4.5r \leq 20$   
(B)  $3.5r + 4.5f \leq 20$   
(C)  $3.5f + 4.5r \geq 20$   
(D)  $3.5r + 4.5f \geq 20$

14. Which is the graph of  $2x - 3y < 12$ ?



15. Use the graph.



Which inequality is represented in the graph?

- (A)  $x \leq 1$
  - (B)  $x \geq 1$
  - (C)  $y \leq 1$
  - (D)  $y \geq 1$
16. Given  $f(x) = 5x - 2$ . What is  $f(4)$ ?

- (A) 18
- (B) 54
- (C)  $20x - 2$
- (D)  $20x - 8$

17. Kathy has two sets of numbers,  $A$  and  $B$ . The sets are defined as follows:

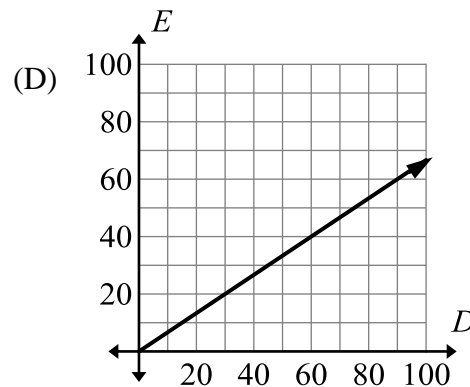
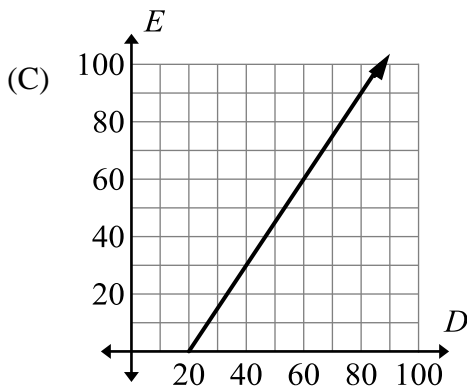
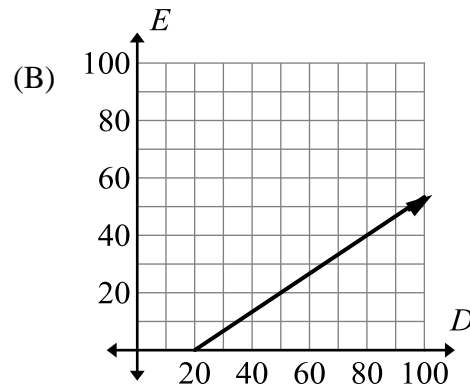
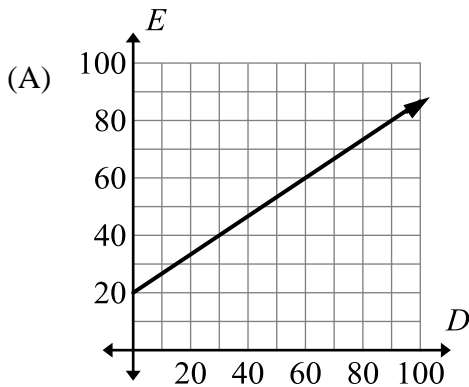
$$A = \{1, 2, 3\}$$

$$B = \{10, 20, 30\}$$

Kathy created four relations using elements from Set  $A$  for the domains and elements from Set  $B$  for the ranges. Which of Kathy's relations is NOT a function?

- (A)  $\{(1, 10), (1, 20), (1, 30)\}$
- (B)  $\{(1, 10), (2, 10), (3, 10)\}$
- (C)  $\{(1, 10), (2, 20), (3, 30)\}$
- (D)  $\{(1, 10), (2, 30), (3, 20)\}$

18. The exchange rate for U.S. Dollars to Euros is  $\$1.50 = 1$  Euro. At a bank, there is a flat  $\$20.00$  service fee to exchange dollars for Euros. Which graph shows how many Euros  $E$  would be received if an amount  $D$  in U.S. Dollars were exchanged at the bank?



19. Lana is buying balloons for a party. Small balloons cost 30 cents each; large balloons cost 80 cents each. Lana has \$3.00 to spend on balloons.

The number of large balloons  $L$  she can buy as a function of the number of small balloons  $S$  bought is given by  $L(S) = \frac{300 - 30S}{80}$ . What are the domain and range of this function?

- (A) domain: all real numbers  
range: all real numbers
- (B) domain: all real numbers, where  $0 \leq S \leq 10$   
range: all real numbers, where  $0 \leq L \leq 3.75$
- (C) domain: all positive integers  
range: all positive integers
- (D) domain: all integers, where  $0 \leq S \leq 10$   
range: all integers, where  $0 \leq L \leq 3$
20. Use the table below.

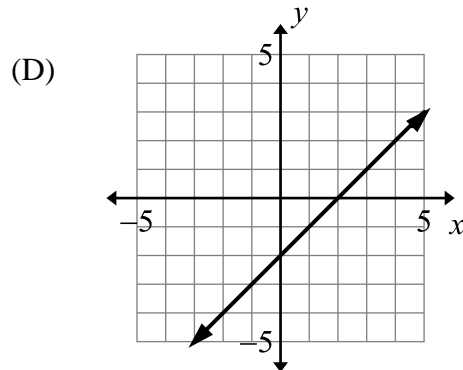
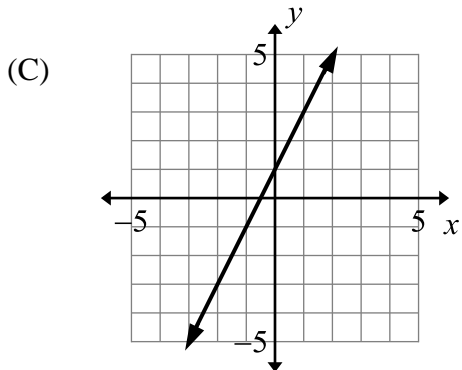
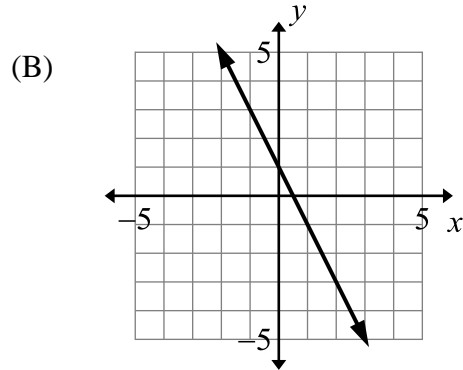
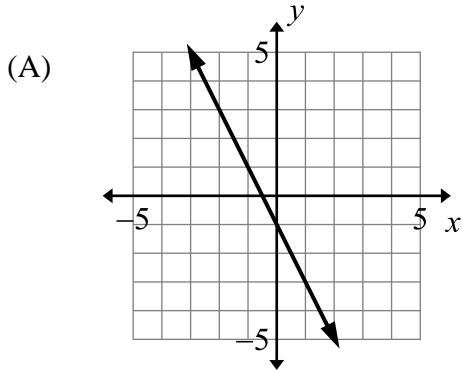
$x$	$f(x)$
3	10
6	14
9	18
12	22

What is the slope of  $y = f(x)$ ?

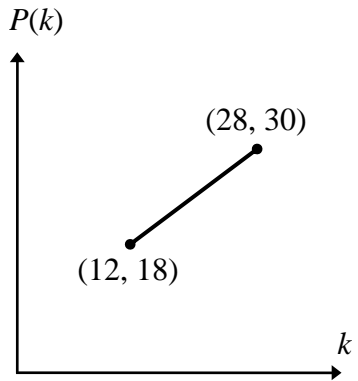
- (A) 4
- (B)  $\frac{4}{3}$
- (C)  $\frac{10}{3}$
- (D)  $\frac{22}{12}$



21. Which is the graph of  $y = -2x + 1$ ?



22. The graph shows a line segment.



Which equation best describes the line segment?

(A)  $P(k) = \frac{3}{4}k + 9$

(B)  $P(k) = \frac{3}{4}k + 18$

(C)  $P(k) = \frac{4}{3}k + 2$

(D)  $P(k) = \frac{4}{3}k + 12$

23. What are the intercepts of the line with equation  $2x - 3y = 30$ ?

(A)  $(-10, 0)$  and  $(0, 15)$

(B)  $(6, 0)$  and  $(0, -6)$

(C)  $(15, 0)$  and  $(0, -10)$

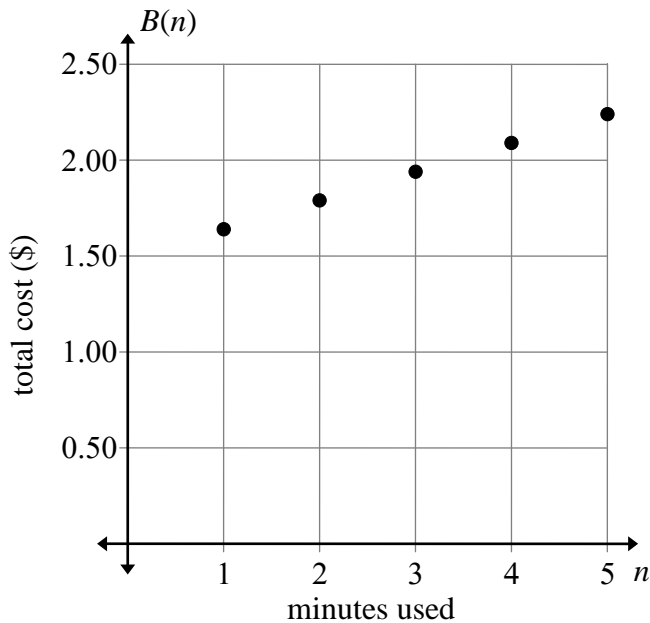
(D)  $(30, 0)$  and  $(0, -30)$

For questions 24–26, use the scenario below.

A phone call using a prepaid card consists of a fixed fee to place the call plus an additional fee for each minute of the call.

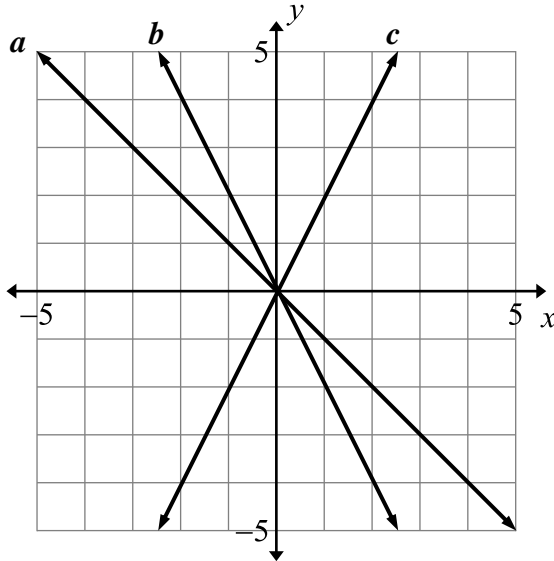
The cost of an  $n$ -minute phone call with a card from Company A is  $A(n) = \$0.99 + \$0.25n$ , where  $n$  is a positive integer.

The cost of an  $n$ -minute phone call with a card from Company B is shown in the graph below.



24. The per minute fee for Company B is greater than Company A.
- (A) True  
(B) False
25. The fixed fee for Company B is greater than Company A.
- (A) True  
(B) False
26. A call using Company B will always cost more than the same length call using Company A.
- (A) True  
(B) False

27. This graph shows three lines named  $a$ ,  $b$ , and  $c$ .



Which ratio of the lines' slopes equals  $\frac{1}{2}$ ?

- (A)  $\frac{\text{slope of line } a}{\text{slope of line } b}$
- (B)  $\frac{\text{slope of line } a}{\text{slope of line } c}$
- (C)  $\frac{\text{slope of line } b}{\text{slope of line } a}$
- (D)  $\frac{\text{slope of line } c}{\text{slope of line } b}$

28. To fix a clogged pipe, Dripmaster Plumbing charges \$75 plus \$40 per hour. NoClog Plumbers charges \$50 plus \$70 per hour for the same service. Which function shows the difference in charges between the two companies for a repair taking  $h$  hours?

- (A) difference =  $\$20 - \$35h$
- (B) difference =  $\$25 - \$30h$
- (C) difference =  $\$25 - \$110h$

29. Sam is beginning an exercise program that begins the first week with 30 minutes of daily exercise. Each week, daily exercise is increased by 5 minutes. Which function represents the number of minutes of daily exercise in week  $n$ ?

- (A)  $f(1) = 30; f(n) = 30n$ , for  $n \geq 2$
- (B)  $f(1) = 30; f(n) = 5n + 30$ , for  $n \geq 2$
- (C)  $f(1) = 30; f(n) = f(n-1) + 5$ , for  $n \geq 2$
- (D)  $f(1) = 30; f(n) = 5f(n-1)$ , for  $n \geq 2$

30. The first five terms of a sequence are given.

14   17   20   23   26

Which equation describes the  $n^{\text{th}}$  term of the sequence?

- (A)  $f(n) = 3 + 11n$
- (B)  $f(n) = 11 + 3n$
- (C)  $f(n) = 14 + 17n$
- (D)  $f(n) = 17 - 3n$

31. What are the first five terms of the sequence defined as

$$a(1) = 3$$

$$a(n + 1) = a(n) - 4, \text{ for } n \geq 1?$$

- (A)  $-3, -2, -1, 0, 1$
- (B)  $-1, -5, -9, -13, -17$
- (C)  $3, -1, -5, -9, -13$
- (D)  $3, -1, 0, 1, 2$

32. Let  $g(x) = 2x - 6$ . Which expression represents  $g(2x)$ ?

- (A)  $x - 3$
- (B)  $2x - 12$
- (C)  $4x - 12$
- (D)  $4x - 6$

For questions 33–34, use the table.

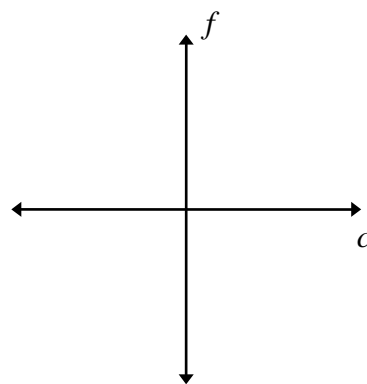
$x$	3	5	8	12	17
$y$	12	16	22	30	40

33. The ordered pairs  $(x, y)$  form a linear function.
- (A) True  
(B) False
34. The value of  $y$  changes by increasingly larger amounts for each change of 1 in  $x$ .
- (A) True  
(B) False

35. What is the equation of the line that passes through the points  $(5, -1)$  and  $(4, -5)$ ?
- (A)  $y - 5 = 4(x + 4)$   
(B)  $y + 5 = 4(x - 4)$   
(C)  $y - 5 = \frac{1}{4}(x + 4)$   
(D)  $y + 5 = \frac{1}{4}(x - 4)$

36. When the function  $f = k + ac$  is graphed on the axes shown, what quantity corresponds to the intercept on the vertical axis?

- (A)  $f$   
(B)  $k$   
(C)  $f - k$   
(D)  $\frac{f - k}{a}$



For questions 37–39, use the inequality  $y < \frac{x}{2} + 1$ .

37. (0, 1) is a solution of the inequality.

- (A) True
- (B) False

38. (1, 2) is a solution of the inequality.

- (A) True
- (B) False

39. (2, 0) is a solution of the inequality.

- (A) True
  - (B) False
- 

40. A line is defined by the equation  $y = \frac{2}{5}x + 3$ . Which ordered pair does NOT represent a point on the line?

- (A) (–5, 0)
- (B) (0, 3)
- (C)  $(1, \frac{17}{5})$
- (D) (5, 5)

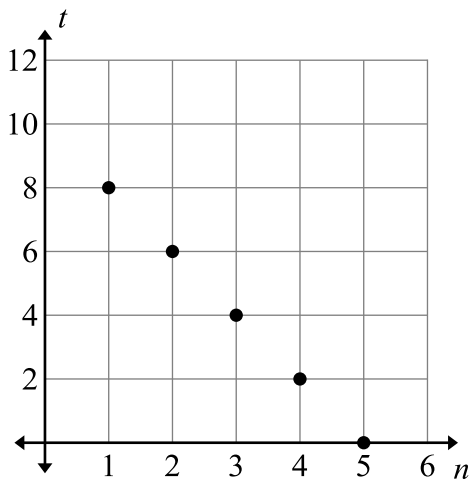
41. What is the equation of the horizontal line through the point (4, –7)?

- (A)  $x = 4$
- (B)  $x = -7$
- (C)  $y = 4$
- (D)  $y = -7$

42. A sequence  $t$  is defined as  $t(n) = 0.57 - 0.06n$ , where  $n \geq 1$ . Which is an equivalent recursive definition for sequence  $t$ ?

- (A)  $t(1) = 0.57; t(n+1) = t(n) - 0.06$ , for  $n \geq 1$
- (B)  $t(1) = 0.51; t(n+1) = t(n) - 0.06$ , for  $n \geq 1$
- (C)  $t(1) = 0.57; t(n+1) = t(n) - 0.51$ , for  $n \geq 1$
- (D)  $t(1) = 0.51; t(n+1) = t(n) - 0.51$ , for  $n \geq 1$

43. The graph shows the first five terms of an arithmetic sequence whose domain is the positive integers.

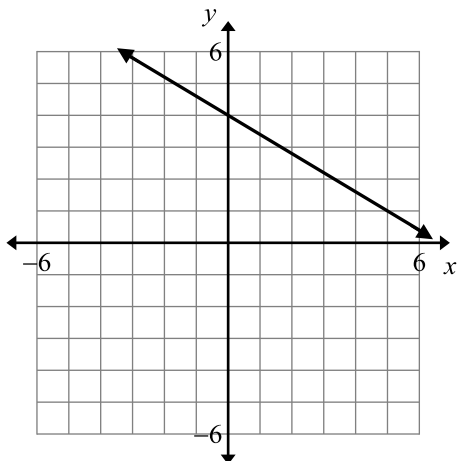


Which is a definition of the sequence?

- (A)  $t(n) = 8 - n$
- (B)  $t(n) = 8 - 2n$
- (C)  $t(n) = 10 - n$
- (D)  $t(n) = 10 - 2n$



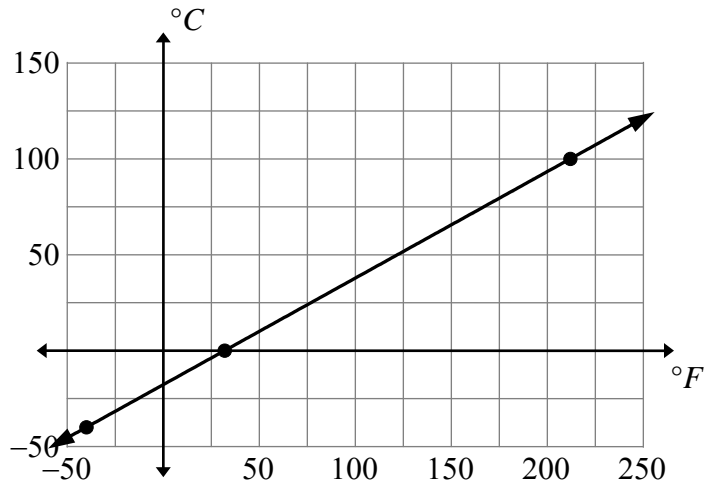
44. Use the graph.



What is the slope of the line?

- (A)  $\frac{3}{5}$
- (B)  $\frac{5}{3}$
- (C)  $-\frac{3}{5}$
- (D)  $-\frac{5}{3}$

For questions 45–46, use this graph that helps convert temperatures from degrees Fahrenheit to degrees Celsius.



Three important temperatures are shown on the graph:  $-40^{\circ}\text{F} = -40^{\circ}\text{C}$ ,  $32^{\circ}\text{F} = 0^{\circ}\text{C}$ , and  $212^{\circ}\text{F} = 100^{\circ}\text{C}$ .

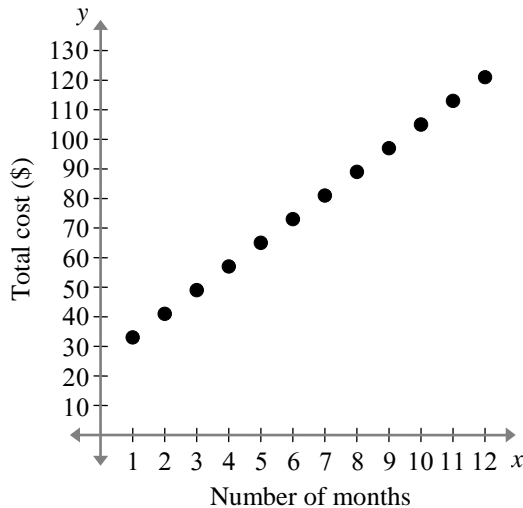
45. A temperature increase of  $9^{\circ}\text{F}$  corresponds to an increase of  $5^{\circ}\text{C}$ .

- (A) True
- (B) False

46. The slope of the line is  $1.8 \frac{^{\circ}\text{F}}{^{\circ}\text{C}}$ .

- (A) True
- (B) False

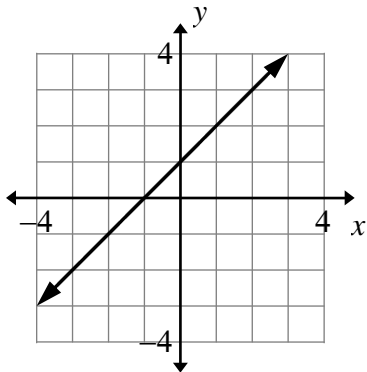
47. An online music service charges a \$25 start-up fee plus \$8 per month for unlimited downloads. The graph illustrates the total cost of a membership for a given number of months.



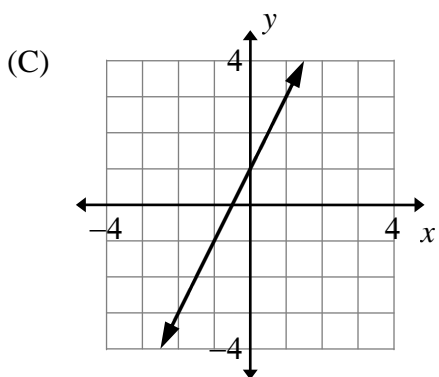
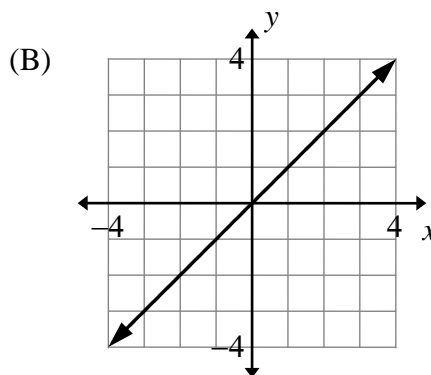
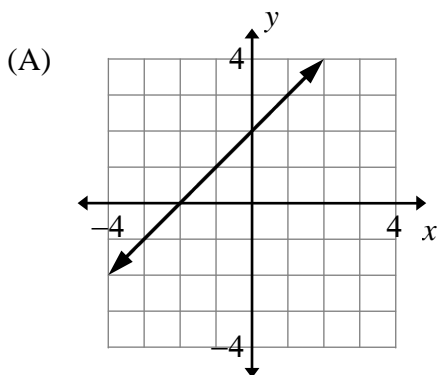
What would happen to the graph if the start-up fee changed from \$25 to \$32?

- (A) The slope would increase by \$7/month.
  - (B) The slope would decrease by \$7/month.
  - (C) The graph would translate up \$7.
  - (D) The graph would translate down \$7.
48. A certain child’s weight was measured at 16.6 pounds. The child then gained weight at a rate of 0.65 pounds per month. On a graph of weight versus time, what would  $0.65 \frac{\text{pounds}}{\text{month}}$  represent?
- (A) The y-intercept of the graph
  - (B) The x-intercept of the graph
  - (C) The slope of the graph

49. The graph shows the linear function  $y = f(x)$ .



Which graph shows  $y = f(x) + 1$ ?



50. Steve borrows \$4,800 from his parents to purchase a used car. No interest is charged on the loan and Steve will pay his parents \$150 per month until the loan is paid off.
- (a) Write a function that describes the relationship between the amount Steve owes his parents and the number of months since the loan was made.
  - (b) What are the domain and range of the function in part (a)? What do these represent in context of the situation?
  - (c) Graph the function in part (a), identify important points, and explain why they are important.
51. A sequence  $t$  is defined where the first term is  $-4$ . Each successive term is 3 more than the term before it.
- (a) Write an explicit formula for the sequence  $t$ .
  - (b) A second function is defined as  $s(n) = 2 + 2n$ . Compare the rates of change of  $t(n)$  and  $s(n)$ .
  - (c) For what value(s) of  $n$  does  $t(n) = s(n)$ ? Show your work.
52. The table shows points on two linear functions,  $f$  and  $g$ .

$x$	-2	-1	0	1	2	3
$f(x)$	-0.4	0.1	0.6	1.1	1.6	2.1
$g(x)$	-7.0	-4.6	-2.2	0.2	2.6	5.0

What is the approximate  $x$ -value of the intersection of  $y = f(x)$  and  $y = g(x)$ ?

- (A)  $x \approx -1.2$
- (B)  $x \approx 0.6$
- (C)  $x \approx 0.9$
- (D)  $x \approx 1.5$

53. What is the  $x$ -coordinate of the point of intersection of these two lines?

$$\begin{cases} y = -2x - 5 \\ 4x + y = 1 \end{cases}$$

- (A)  $-11$
- (B)  $1$
- (C)  $3$
- (D) The lines do not intersect.

54. Use the system of equations.

$$\begin{cases} -8x - 4y = -64 \\ 2x + y = 16 \end{cases}$$

Which describes the solution set of the system?

- (A) There is a single solution of  $(0, 16)$ .
- (B) There is a single solution of  $(8, 0)$ .
- (C) There are no solutions to the system.
- (D) There are an infinite number of solutions to the system.

55. Use this system of equations.

$$\begin{cases} -4x + 2y = 8 \\ 3x + 10y = 6 \end{cases}$$

If the second equation is rewritten as

$$3x + 5(m) = 6,$$

which expression is equivalent to  $m$ ?

- (A)  $-3x + 6$
- (B)  $2x + 4$
- (C)  $4x + 8$

56. Use the system of equations.

$$\begin{cases} x + 8y = 3 \\ 2x - 2y = -7 \end{cases}$$

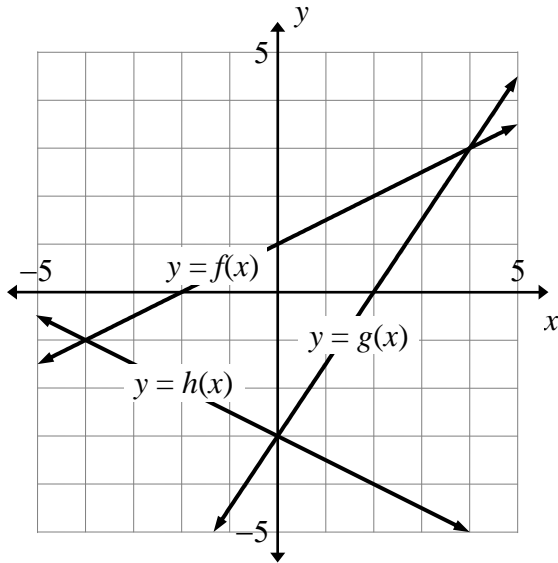
Which step(s) would create equations so that the coefficients of one of the variables are opposites?

- (A) Multiply the first equation by 7.  
Multiply the second equation by 3.
- (B) Multiply the first equation by  $-2$ .  
Multiply the second equation by 4.
- (C) Multiply the first equation by 2.
- (D) Multiply the second equation by 4.

57. Michael has 34 coins in nickels and dimes. The total value of the coins is \$2.45. If Michael has  $d$  dimes and  $n$  nickels, which system of equations can be used to find the number of each coin?

- (A)  $\begin{cases} d + n = 15 \\ 5d + 10n = 245 \end{cases}$
- (B)  $\begin{cases} d + n = 15 \\ 10d + 5n = 245 \end{cases}$
- (C)  $\begin{cases} d + n = 34 \\ 5d + 10n = 245 \end{cases}$
- (D)  $\begin{cases} d + n = 34 \\ 10d + 5n = 245 \end{cases}$

58. Use the graph.



If  $f(x_1) = g(x_1)$  and  $g(x_2) = h(x_2)$ , what is  $f(x_1) + g(x_2)$ ?

- (A) -3
- (B) 0
- (C) 3
- (D) 4



59. In a community service program, students earn points for two tasks: painting over graffiti and picking up trash. The following constraints are imposed on the program.

- 1) A student may not serve more than 10 total hours per week.
- 2) A student must serve at least 1 hour per week at each task.

Let  $g$  = the number of hours a student spends in a week painting over graffiti.

Let  $t$  = the number of hours a student spends in a week picking up trash.

Which system represents the imposed constraints?

(A) 
$$\begin{cases} g + t \leq 10 \\ g \geq 1 \\ t \geq 1 \end{cases}$$

(B) 
$$\begin{cases} g + t \leq 10 \\ g \geq 0 \\ t \geq 0 \end{cases}$$

(C) 
$$\begin{cases} g + t \leq 8 \\ g \geq 1 \\ t \geq 1 \end{cases}$$

(D) 
$$\begin{cases} g + t \leq 8 \\ g = t \end{cases}$$

60. Use the system of linear equations.

$$\begin{cases} kx - 3y = 8 \\ 2x - 6y = m \end{cases}$$

Which values of  $k$  and  $m$  make the lines parallel?

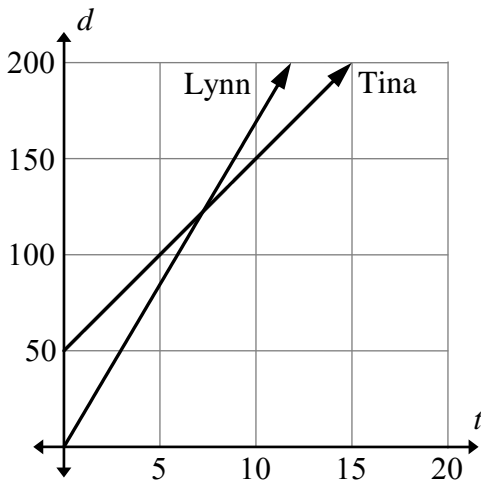
- (A)  $k = -2, m = -16$
- (B)  $k = 1, m = 10$
- (C)  $k = 1, m = 16$
- (D)  $k = 2, m = 8$

61. How many solutions does the system of equations have?

$$\begin{cases} -6x - 4y = -64 \\ 3x + 2y = 32 \end{cases}$$

- (A) no solution
- (B) one solution
- (C) two solutions
- (D) infinitely many solutions

62. Lynn and Tina are planning a foot race. Lynn can run 16.9 feet per second and Tina can run 10 feet per second. Lynn gives Tina a 50-foot head start. The diagram below shows distance-time graphs for Lynn and Tina.



After about how much time will Lynn pass Tina?

- (A) 5 seconds
- (B) 7 seconds
- (C) 10 seconds
- (D) 12 seconds

63. Use the system of equations.

$$\begin{cases} x + y = 35 \\ -5x + 10y = 200 \end{cases}$$

- (a) Find the solution to the system.
- (b) Explain why the solution from part (a) is also a solution to  $-4x + 11y = 235$ .

64. Use the linear equation  $y = -2x + 5$ .

- (a) Identify two solutions to the equation.
- (b) Write a second linear equation that has one of your answers in part (a) as a solution, but not the other.
- (c) Write a third linear equation that has the solution  $(0, 0)$ , but has no solutions in common with  $y = -2x + 5$ .

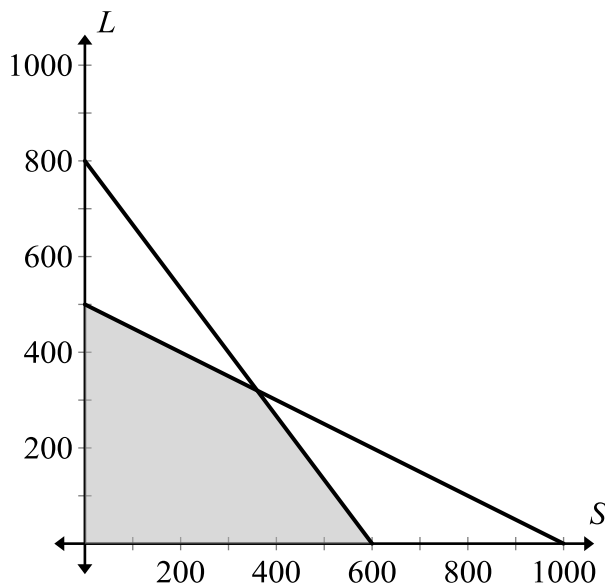
65. A toy company is manufacturing a new doll. The cost of producing the doll is \$10,000 to start plus \$3 per doll. The company will sell the doll for \$7 each.

- (a) Write functions  $C(n)$  and  $I(n)$  to represent the cost of producing the dolls and income from selling the dolls, respectively.
- (b) Graph the functions.
- (c) How many dolls must be produced for the company to break even, i.e.  $C(n) = I(n)$ ?
- (d) Compute  $I(1500) - C(1500)$ . What does this mean for the company?

66. For a fundraiser, an art club is making paper frogs. Here are some conditions about the fundraiser.

- The club has 500 sheets of paper to make frogs.
- One sheet of paper will produce one large frog.
- One sheet of paper will produce two small frogs.
- The club can produce 15 small frogs per hour.
- The club can produce 20 large frogs per hour.
- The club has 40 hours to produce the frogs.

This graph shows how many of each size frog can be made under the conditions.



(a) Identify the vertices of the shaded region.

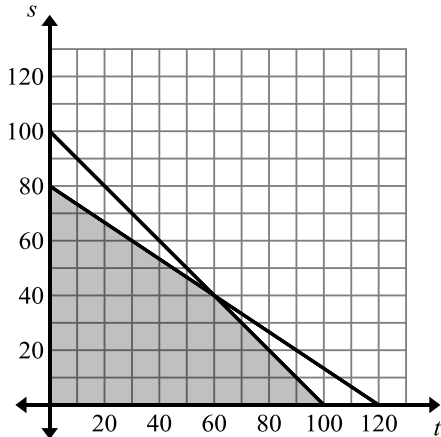
The club will sell large frogs for \$3 each and small frogs for \$2 each. Income is maximized using quantities from at least one of the vertices of the shaded region.

(b) What is the maximum income and how many of each size frog should be produced?

(c) One boundary of the region is  $\frac{1}{2}S + L = 500$ . Explain what this equation means in context of the situation.

67. The volleyball team is having a fundraiser and can purchase t-shirts for \$10 and sweatshirts for \$15. The team has a budget of \$1200. Due to shipping costs, no more than a total of 100 t-shirts and sweatshirts combined can be ordered. Let  $t$  represent the number of t-shirts sold and  $s$  represent the number of sweatshirts sold.

The constraints are illustrated in the graph.



The team makes a profit of \$6 on each t-shirt and \$10 on each sweatshirt. How many of each need to be sold to maximize profit?

The objective function for profit is  $P = 6t + 10s$ .

- (A) 60 t-shirts, 40 sweatshirts
- (B) 40 t-shirts, 60 sweatshirts
- (C) 0 t-shirts, 80 sweatshirts
- (D) 100 t-shirts, 0 sweatshirts

For questions 68–70, determine which expressions are equal to  $(1+0.06)^t$ .

68.  $1.06^t = (1+0.06)^t$

- (A) True
- (B) False

69.  $1+0.06^t = (1+0.06)^t$

- (A) True
- (B) False

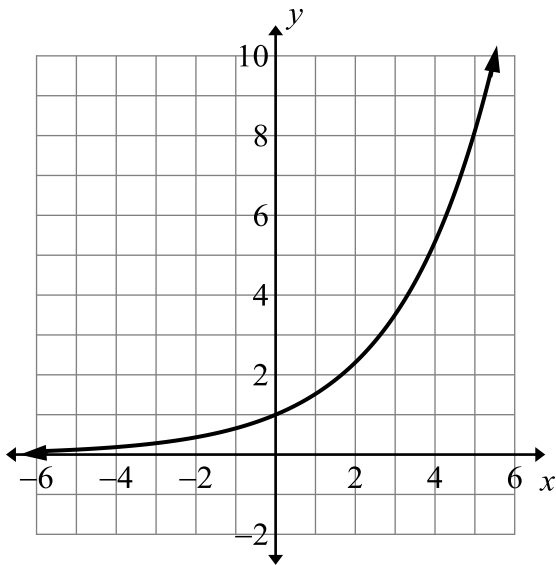
70. The growth rate is 6%?

- (A) True
- (B) False

71. If  $f(x) = 2^x$ , where is the y-intercept of  $g(x) = f(x) + 4$ ?

- (A) (0,4)
- (B) (0,5)
- (C) (0,1)
- (D) (1,0)

72. This is the graph of  $y = 1.52^x$ .



Which inequality contains the solution to  $1.52^x = 4$ ?

- (A)  $x < 1$
- (B)  $1 < x < 2$
- (C)  $3 < x < 4$
- (D)  $5 < x < 6$

For questions 73–75, use the function  $f(x) = 2^x$ .

73. The y-intercept of  $y = f(x)$  is  $(0, 1)$ .

- (A) True
- (B) False

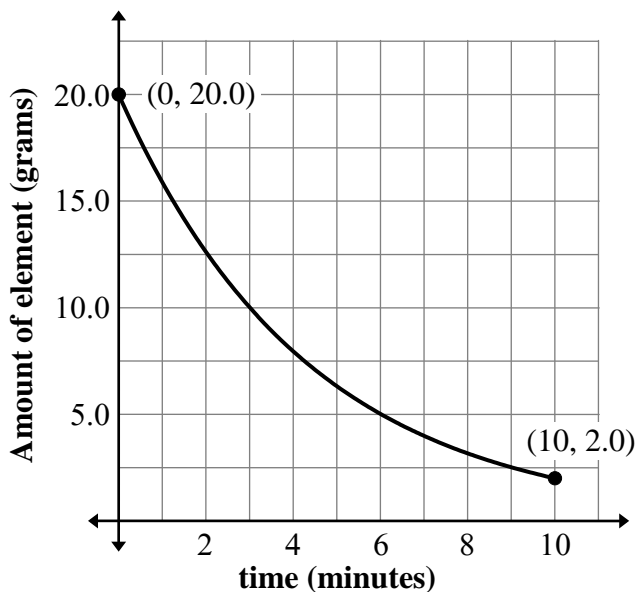
74. The slope of  $y = f(x)$  is equal for all values of  $x$ .

- (A) True
- (B) False

75. There are no values of  $x$  for which  $f(x) < 0$ .

- (A) True
- (B) False

76. The graph models the amount of a radioactive element present over the course of a 10-minute experiment.

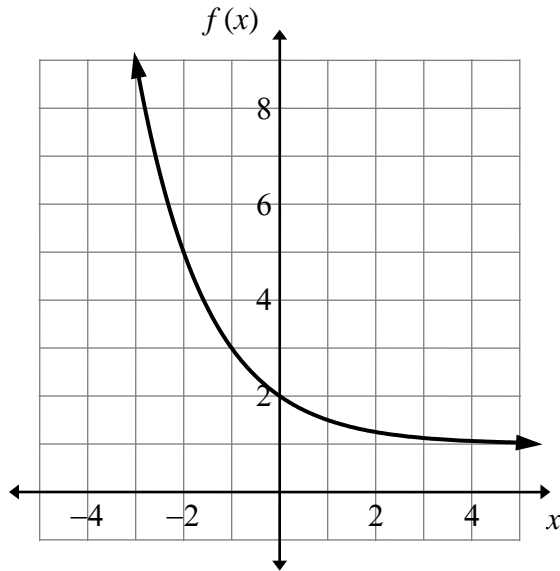


What is the average rate of change of the amount of the element over the 10-minute experiment?

- (A)  $-0.2$  g/min  
(B)  $-1.8$  g/min  
(C)  $-2.0$  g/min  
(D)  $-5.0$  g/min
77. Becky has one piece of paper. She cuts the paper in half and then has two pieces. She cuts these in half to get four pieces. The process continues. Which describes how many pieces she has at each step?
- (A)  $p(1) = 1$ ;  $p(n) = 2p(n-1)$ , for  $n \geq 2$   
(B)  $p(1) = 1$ ;  $p(n) = \frac{1}{2}p(n-1)$ , for  $n \geq 2$   
(C)  $p(1) = 1$ ;  $p(n) = p(n-1) + 1$ , for  $n \geq 2$



78. Use the graph.



What is the equation of the function?

- (A)  $f(x) = -\frac{1}{2}x + 2$
- (B)  $f(x) = -2x + 2$
- (C)  $f(x) = 2^x + 1$
- (D)  $f(x) = \left(\frac{1}{2}\right)^x + 1$

79. Which recursive sequence is equivalent to  $t(n) = 4\left(\frac{2}{3}\right)^n$ ?

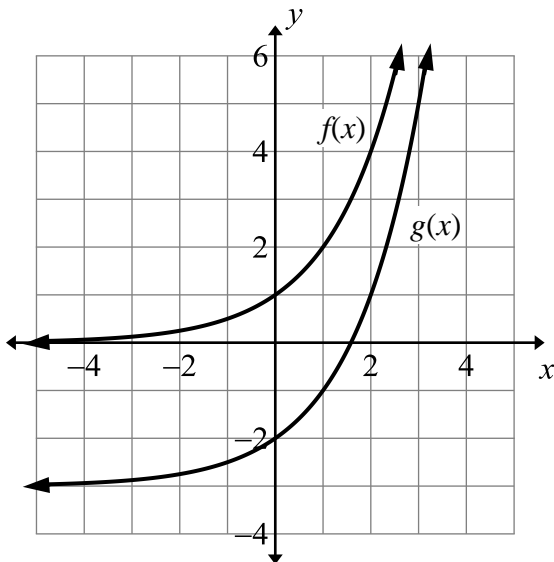
(A)  $t(1) = 4; t(n+1) = \frac{2}{3}t(n)$ , for  $n \geq 1$

(B)  $t(1) = \frac{8}{3}; t(n+1) = \frac{2}{3}t(n)$ , for  $n \geq 1$

(C)  $t(1) = 4; t(n+1) = \left(\frac{2}{3}\right)^{t(n)}$ , for  $n \geq 1$

(D)  $t(1) = \frac{8}{3}; t(n) = \left(\frac{2}{3}\right)^{t(n)}$ , for  $n \geq 1$

80. The graph shows two functions,  $f$  and  $g$ .



Which describes  $g(x)$  in terms of  $f(x)$ ?

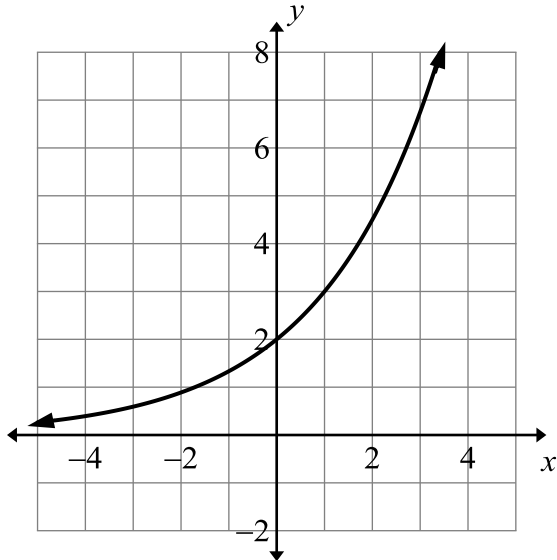
(A)  $g(x) = -2f(x)$

(B)  $g(x) = f(x-3)$

(C)  $g(x) = f(x) - 3$

81. A student noticed that the value of  $f(2)$  is 10% less than  $f(1)$ . He also noticed that  $f(3)$  is 10% less than  $f(2)$ . Which is true?
- (A)  $f$  is a linear function with slope  $\frac{1}{10}$ .
- (B)  $f$  is a linear function with slope  $\frac{9}{10}$ .
- (C)  $f$  is an exponential function with base  $\frac{1}{10}$ .
- (D)  $f$  is an exponential function with base  $\frac{9}{10}$ .
82. A population begins with 1,200 individuals and grows at a rate of 10% per year. Which function describes the population?
- (A)  $P(x) = 1200(1.1)^x$
- (B)  $P(x) = 1200(1.2)^x$
- (C)  $P(x) = 1320(1.1)^x$

83. The graph shows an exponential function.



What is the equation of the function?

- (A)  $y = \left(\frac{2}{3}\right)^x$
- (B)  $y = 2(3)^x$
- (C)  $y = 2\left(\frac{3}{2}\right)^x$

84. What is the decay rate in the function  $A(t) = 0.8(0.65)^t$ ?

- (A) 0.20
- (B) 0.35
- (C) 0.52
- (D) 0.65

For questions 85–86, use this scenario.

The tuition at a private college can be modeled by the equation  $T(y) = \$30,000(1.07)^y$ , where  $y$  is the number of years since 2000.

85. The tuition in the year 2000 was \$30,000.

- (A) True
- (B) False

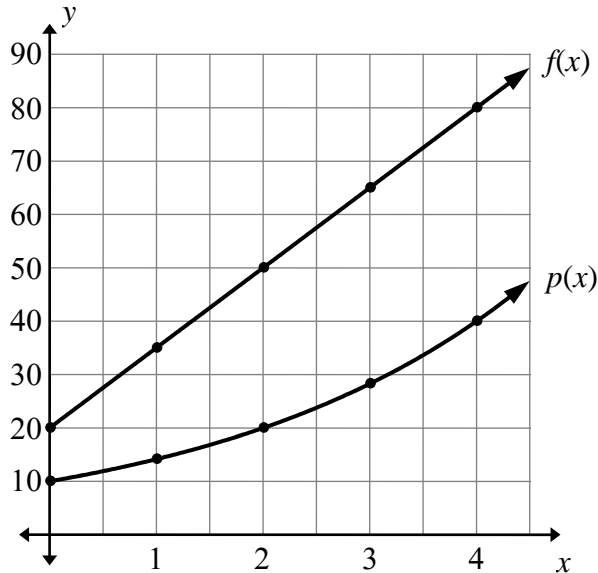
86. The growth rate of tuition is 107%.

- (A) True
  - (B) False
- 

87. Solve each absolute value equation.

- (a)  $|x + 6| = 21$
- (b)  $18 = 3|x - 1|$
- (c)  $3|y| + 4 = 31$
- (d)  $|x - 3| + 14 = 5$

88. The graph shows two functions,  $f$  and  $p$ .



- Which function grows by the same factor over equal intervals? Explain.
- The domains of  $f$  and  $p$  are the non-negative real numbers. Are there values of  $x$  for which  $p(x) > f(x)$ ? Explain.

89. Juan is considering purchasing three online computer games. The cost of each is shown in the table. Some have monthly subscription fees which must be paid each calendar month *before* the game can be played.

Game	Game Price	Subscription Fee
Space Pilot	\$75	None
Puzzles of Gold	\$25	\$10/month
World of Cars	Free	\$25/month

Juan currently has \$50 saved. He earns an allowance of \$15 on the *last day* of every month.

- Which game costs the least if Juan plays it for 2 months? 5 months? 7 months? Support your answers.
- Juan typically plays a game for one year before losing interest. Based on his current savings and future allowance, which game(s) can Juan afford? Explain.
- Are there any games Juan cannot afford now, but could in the future? Explain.
- Can Juan afford more than one game? If so, which ones? Explain.