

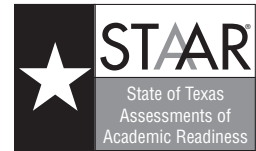
# **Algebra I**

**Administered May 2019**

**RELEASED**



# STAAR ALGEBRA I REFERENCE MATERIALS



## FACTORING

Perfect square trinomials

$$a^2 + 2ab + b^2 = (a + b)^2$$
$$a^2 - 2ab + b^2 = (a - b)^2$$

Difference of squares

$$a^2 - b^2 = (a - b)(a + b)$$

## PROPERTIES OF EXPONENTS

Product of powers

$$a^m a^n = a^{(m+n)}$$

Quotient of powers

$$\frac{a^m}{a^n} = a^{(m-n)}$$

Power of a power

$$(a^m)^n = a^{mn}$$

Rational exponent

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

Negative exponent

$$a^{-n} = \frac{1}{a^n}$$

## LINEAR EQUATIONS

Standard form

$$Ax + By = C$$

Slope-intercept form

$$y = mx + b$$

Point-slope form

$$y - y_1 = m(x - x_1)$$

Slope of a line

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

## QUADRATIC EQUATIONS

Standard form

$$f(x) = ax^2 + bx + c$$

Vertex form

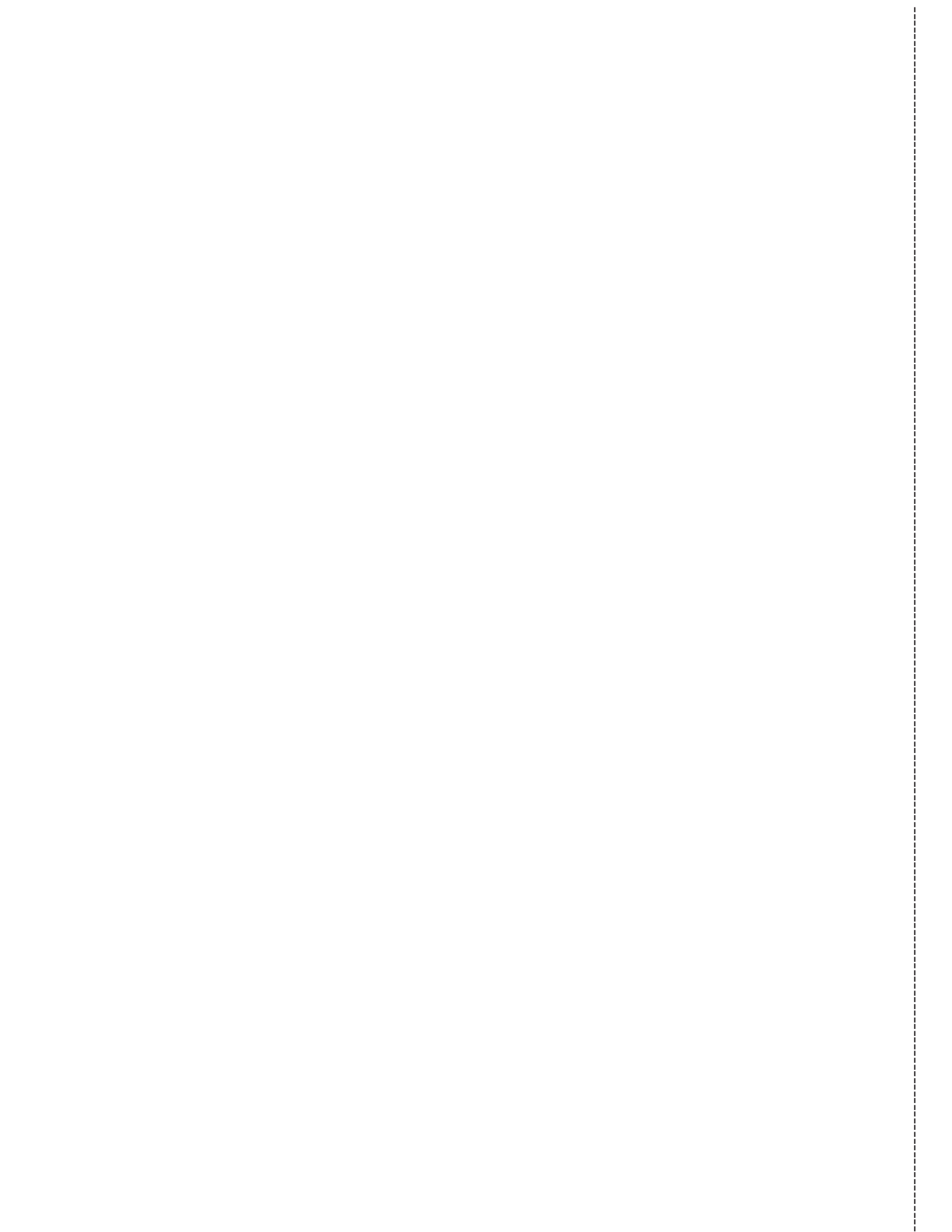
$$f(x) = a(x - h)^2 + k$$

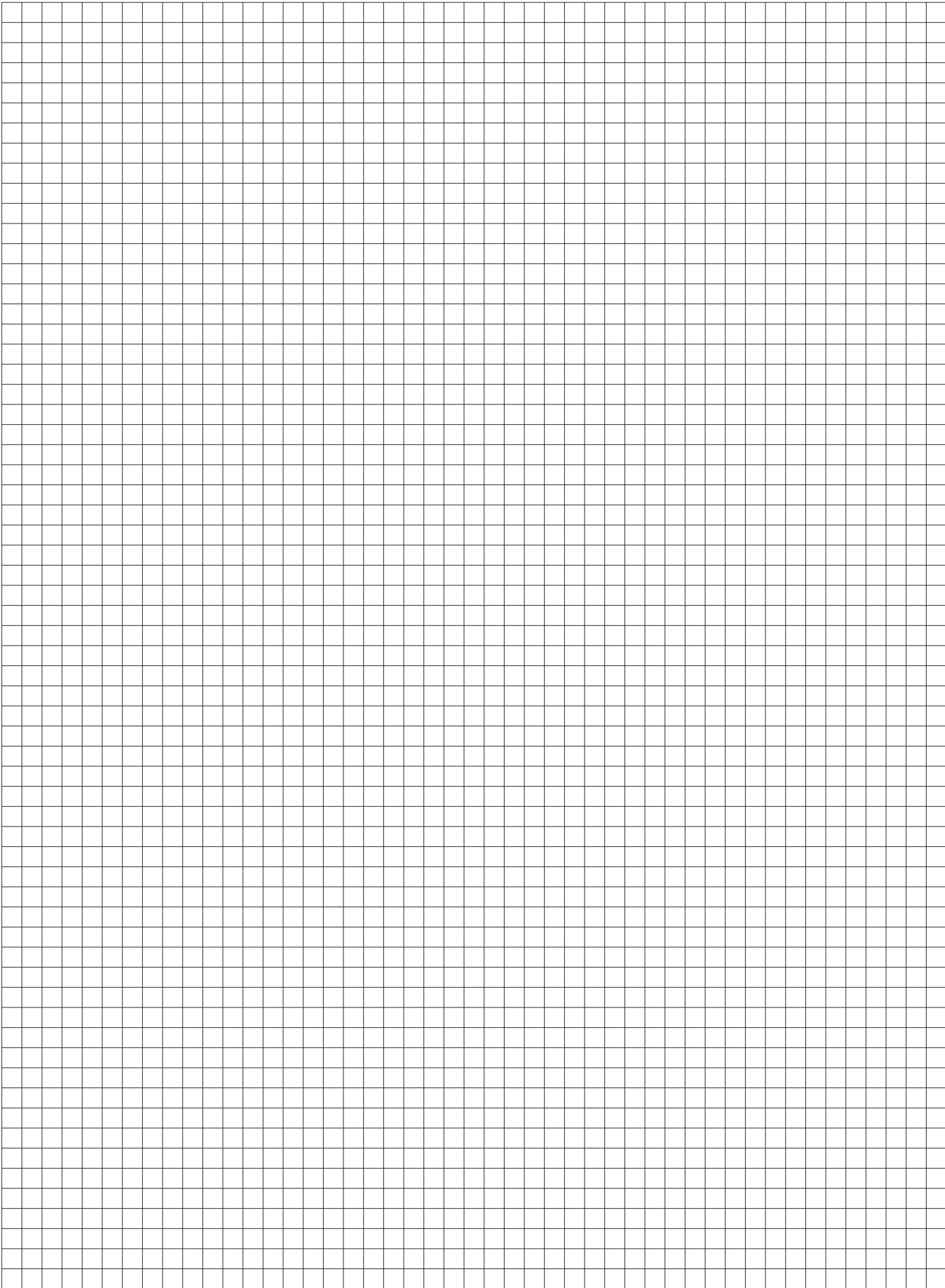
Quadratic formula

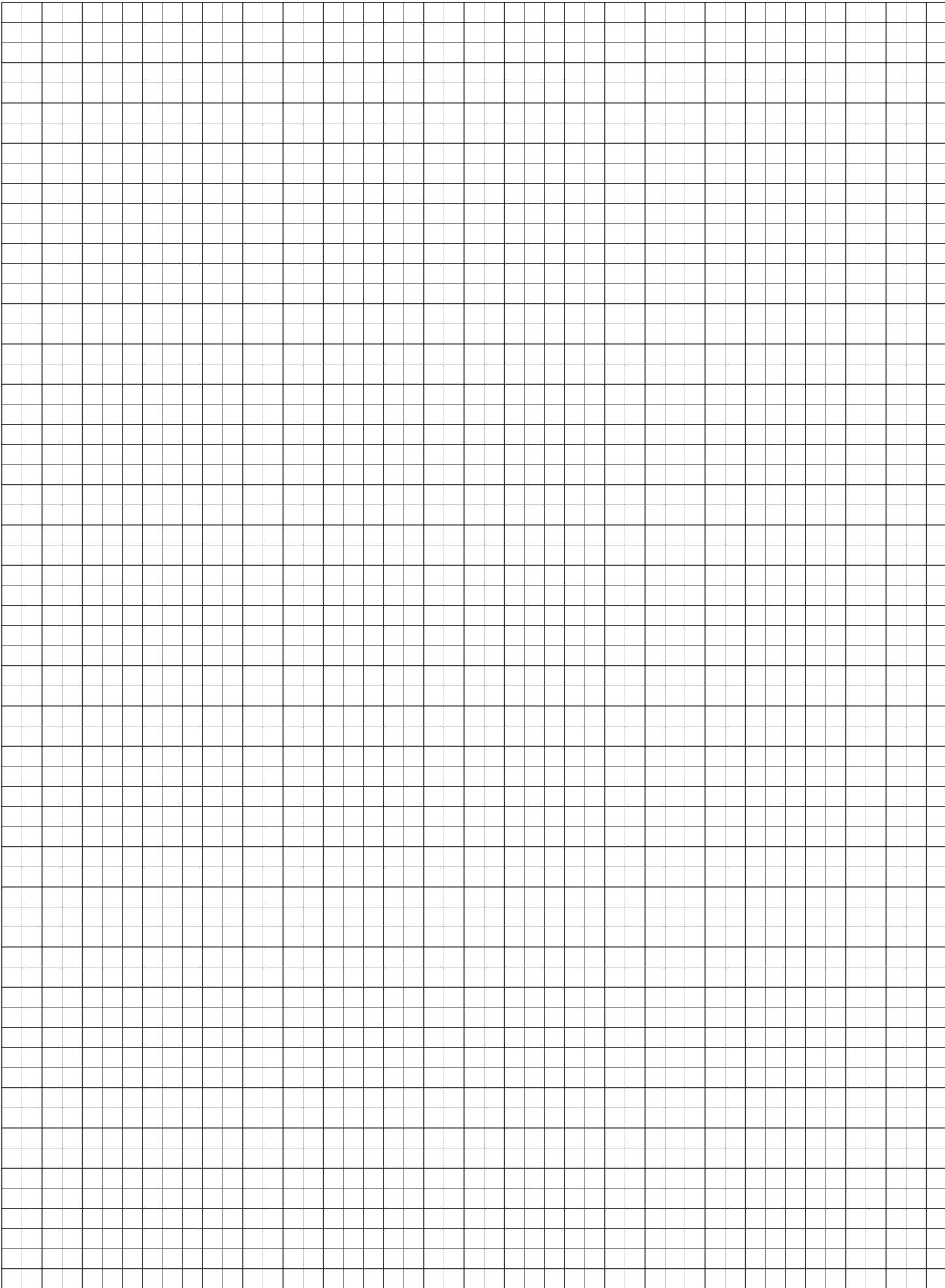
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Axis of symmetry

$$x = \frac{-b}{2a}$$







# ALGEBRA I

## DIRECTIONS

Read each question carefully. For a multiple-choice question, determine the best answer to the question from the four answer choices provided. For a griddable question, determine the best answer to the question. Then fill in the answer on your answer document.

1 What is the slope of the graph of  $y = 12x - 19$ ?

A  $-19$

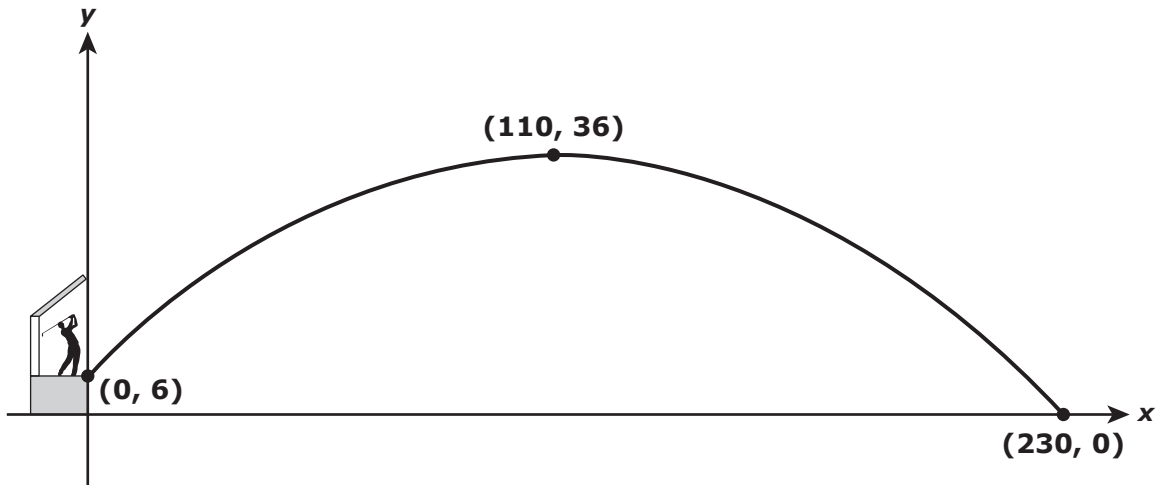
B  $-\frac{12}{19}$

C  $\frac{19}{12}$

D  $12$



- 2 A golfer hit a golf ball from a tee box that is 6 yards above the ground. The graph shows the height in yards of the golf ball above the ground as a quadratic function of  $x$ , the horizontal distance in yards of the golf ball from the tee box.



What is the domain of the function for this situation?

- F**  $0 \leq x \leq 230$
- G**  $6 \leq y \leq 36$
- H**  $0 \leq y \leq 36$
- J**  $6 \leq x \leq 230$
- 
- 3 Which value of  $x$  makes the equation  $1.25(4x - 10) = 7.5$  true?
- A** 3.5
- B** -1
- C** -0.5
- D** 4

4 Which function is equivalent to  $g(x) = x^2 + 15x - 54$ ?

F  $g(x) = (x + 9)(x - 6)$

G  $g(x) = (x + 18)(x - 3)$

H  $g(x) = (x - 9)(x + 6)$

J  $g(x) = (x - 18)(x + 3)$

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5 The table shows the linear relationship between the average height in feet of trees on a tree farm and the number of years since the trees were planted.

Average Tree Height

Number of Years Since the Trees Were Planted	1	3	6	11	15
Average Height (ft)	10	24	45	80	108

What is the rate of change of the average height in feet of the trees on the farm with respect to the number of years since the trees were planted?

A 14 ft/yr

B 3 ft/yr

C 7 ft/yr

D 10 ft/yr

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6 What is the equation in slope-intercept form of the line that passes through the points  $(-4, 2)$  and  $(12, 6)$ ?

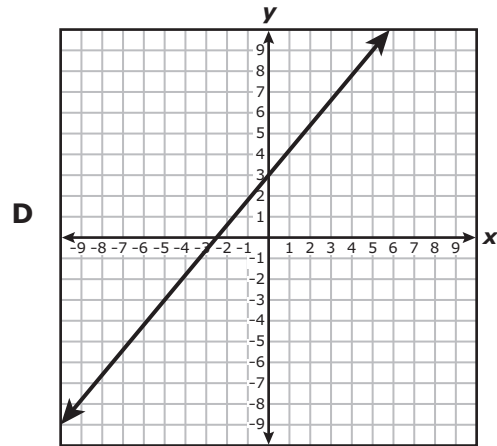
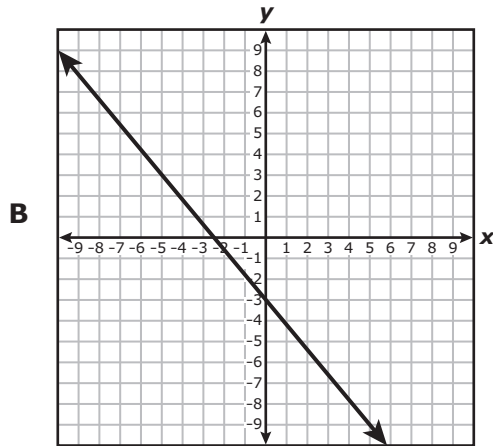
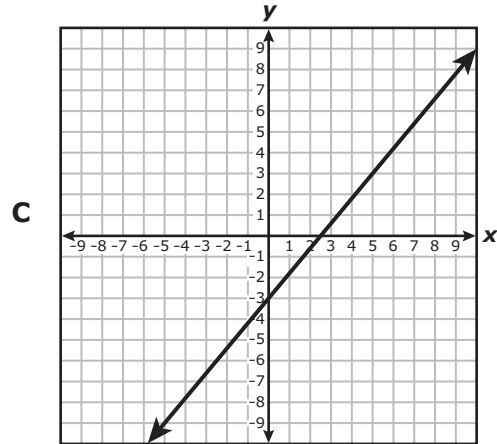
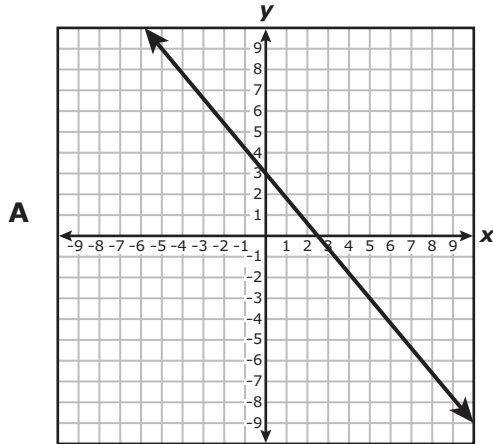
F  $y = 0.25x + 3$

G  $y = 0.25x - 4.5$

H  $y = 4x + 18$

J  $y = 4x - 42$

7 Which graph best represents  $-5y = -6x + 15$ ?

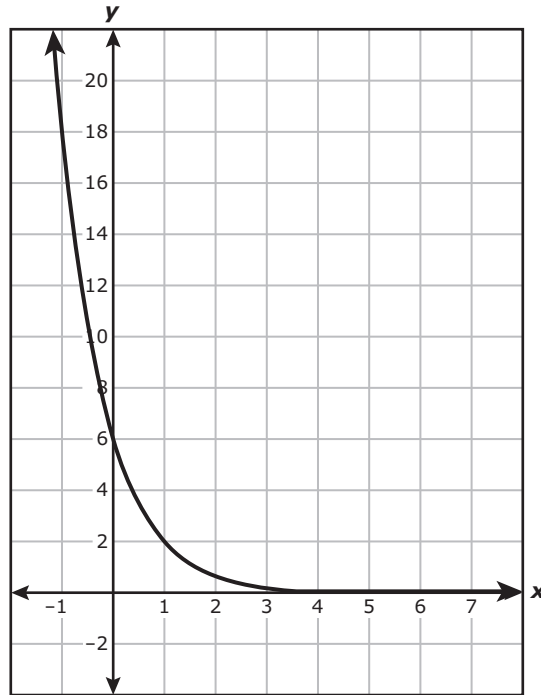


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8 A baker determined the annual profit in dollars from selling pies using  $p(n) = 52n - 0.05n^2$ , where  $n$  is the number of pies sold. What is the annual profit if the baker sells 400 pies?

- F \$20,780
- G \$12,800
- H \$28,800
- J \$20,760

9 An exponential function is graphed on the grid.



Which function is best represented by the graph?

- A  $g(x) = 6\left(\frac{1}{3}\right)^x$
- B  $g(x) = 6(3)^x$
- C  $g(x) = 6 - \left(\frac{1}{3}\right)^x$
- D  $g(x) = 6 - (3)^x$

**10** What is the equation in slope-intercept form of the line that crosses the  $x$ -axis at 36 and is perpendicular to the line represented by  $y = -\frac{4}{9}x + 5$ ?

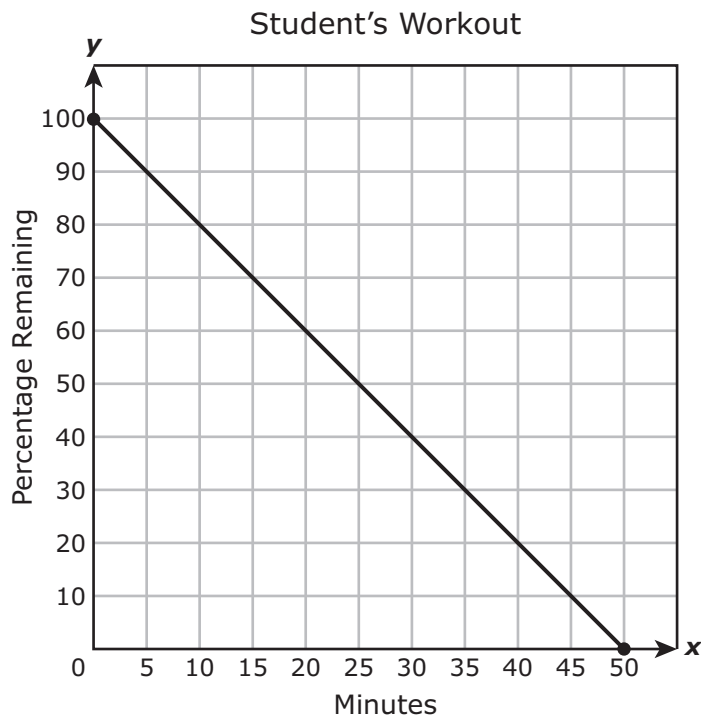
**F**  $y = \frac{4}{9}x + 16$

**G**  $y = \frac{4}{9}x - 16$

**H**  $y = \frac{9}{4}x + 81$

**J**  $y = \frac{9}{4}x - 81$

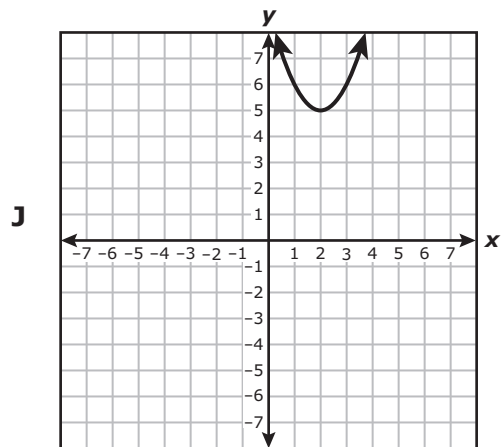
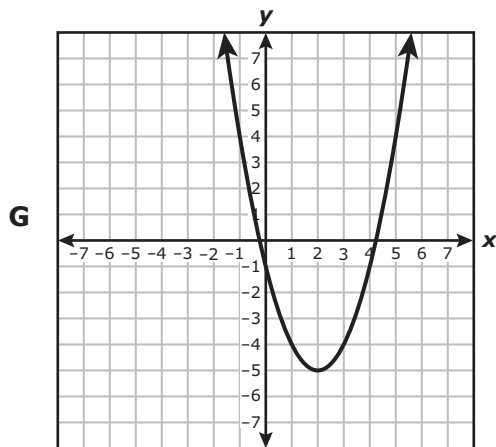
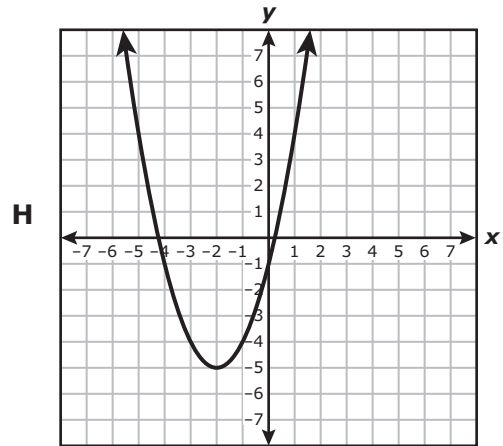
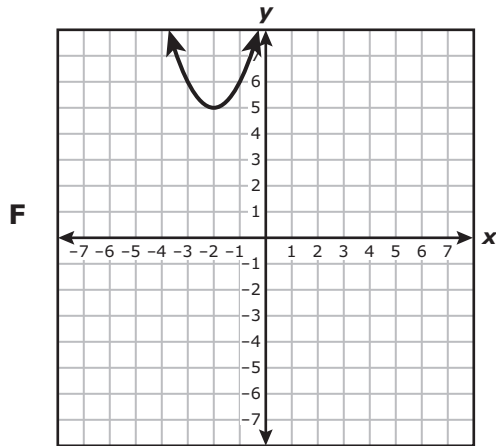
- 11** A student worked out at a gym continuously for 50 minutes. The graph shows the remaining percentage of the workout as a linear function of  $x$ , the time in minutes.



Which answer choice best describes the domain and range of the function for this situation?

- A** Domain: All real numbers greater than or equal to 0 and less than or equal to 100  
Range: All real numbers greater than or equal to 0 and less than or equal to 50
- B** Domain:  $\{-2\}$   
Range:  $\{100\}$
- C** Domain: All real numbers greater than or equal to 0 and less than or equal to 50  
Range: All real numbers greater than or equal to 0 and less than or equal to 100
- D** Domain:  $\{100\}$   
Range:  $\{-2\}$

- 12 The graph of quadratic parent function  $f$  was transformed to create the graph of  $g(x) = f(x + 2) - 5$ . Which graph best represents  $g$ ?



- 13** Which expression is equivalent to  $\frac{45m^{-6}p^2v^{12}}{15m^{-2}p^8v^{-4}}$  for all values of  $m$ ,  $p$ , and  $v$  where the expression is defined?

**A**  $\frac{3v^8}{m^8p^6}$

**B**  $\frac{3v^{16}}{m^4p^6}$

**C**  $\frac{30m^3}{p^4v^3}$

**D**  $\frac{30v^3}{m^3p^4}$

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- 14** What is the positive solution to this equation?

$$4x^2 + 12x = 135$$

Record your answer and fill in the bubbles on your answer document.

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- 15** A grill at a barbecue restaurant will be used to cook sausage links that are 2 lb each and briskets that are 6 lb each. No more than 120 lb of sausage links and briskets will be cooked on the grill.

Which inequality represents all possible combinations of  $x$ , the number of sausage links that will be cooked on the grill, and  $y$ , the number of briskets that will also be cooked?

**A**  $6x + 2y < 120$

**B**  $2x + 6y \leq 120$

**C**  $6x + 2y > 120$

**D**  $2x + 6y \geq 120$



16 Which expression is equivalent to  $(10 + 7r - r^2) + (-6r^2 - 18 + 5r)$ ?

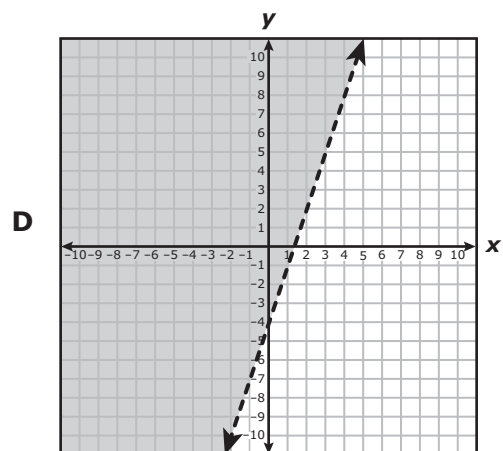
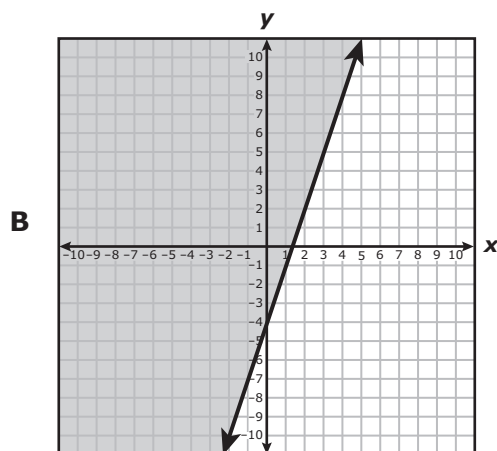
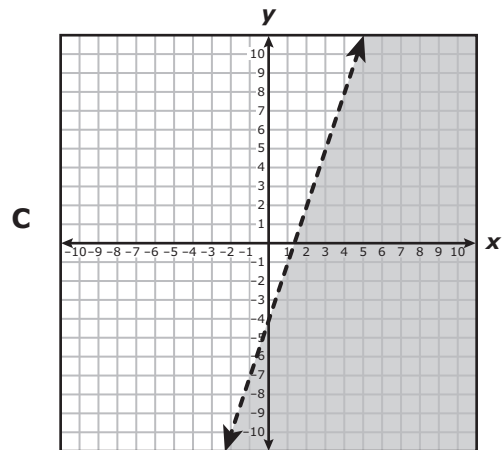
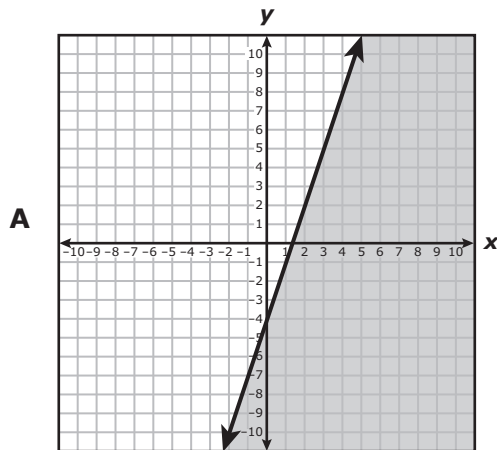
F  $-7r^2 + 2r + 8$

G  $7r^2 + 12r + 8$

H  $-7r^2 + 12r - 8$

J  $7r^2 + 2r - 8$

17 Which graph best represents the solution set of  $y > 3x - 4$ ?



- 18** A bank account earning annual compound interest was opened, and no additional deposits or withdrawals were made after the initial deposit. The balance in the account after  $x$  years can be modeled by  $b(x) = 850(1.025)^x$ .

Which statement is the best interpretation of one of the values in this function?

- F** The initial balance of the account decreases at a rate of 97.5% each year.
- G** The balance in the account increases at a rate of 2.5% each year.
- H** The initial balance of the account was \$1,025.
- J** The balance in the account at the end of one year is \$850.
- 
- 19** A company collected data for the number of text messages sent and received using a text-message application since October 2011. The table shows the number of text messages sent and received in billions over time. The data can be modeled by a quadratic function.

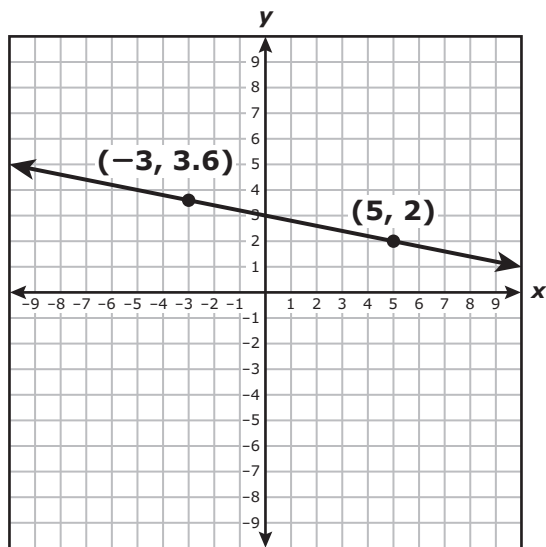
Text Messages

Number of Months since October 2011, $t$	Number of Text Messages, $n(t)$ (billions)
5	3
10	10
15	17
20	27
25	44
30	64
35	86
40	112

Which function best models the data?

- A**  $n(t) = -0.002t^2 + 0.55t + 5.02$
- B**  $n(t) = 0.072t^2 - 0.15t + 2.73$
- C**  $n(t) = -0.002t^2 + 5.02$
- D**  $n(t) = 0.072t^2 + 2.73$

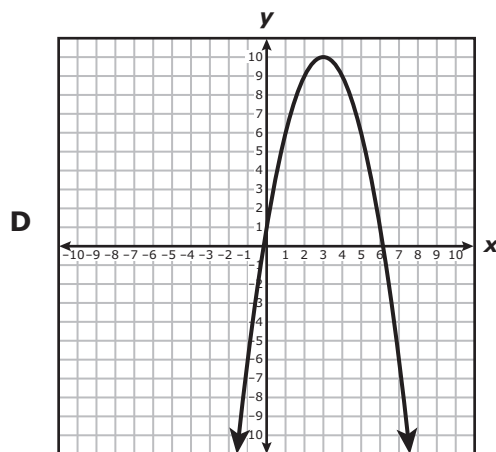
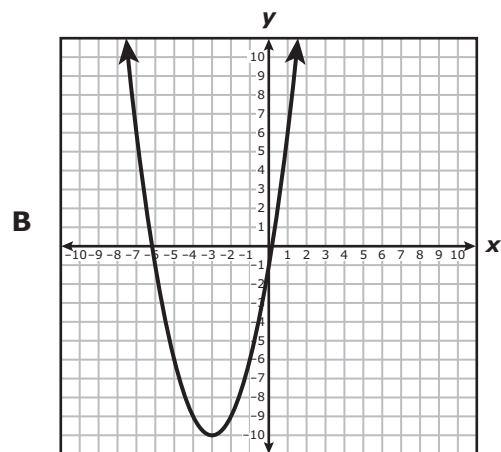
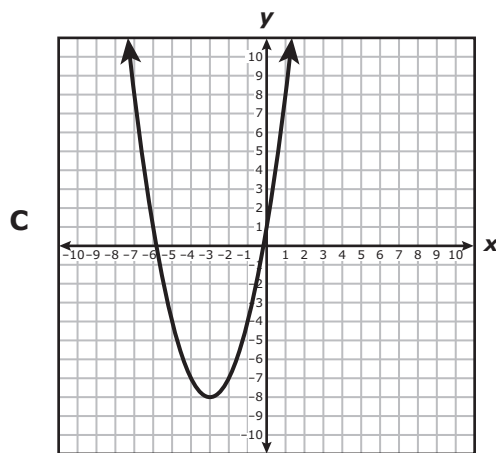
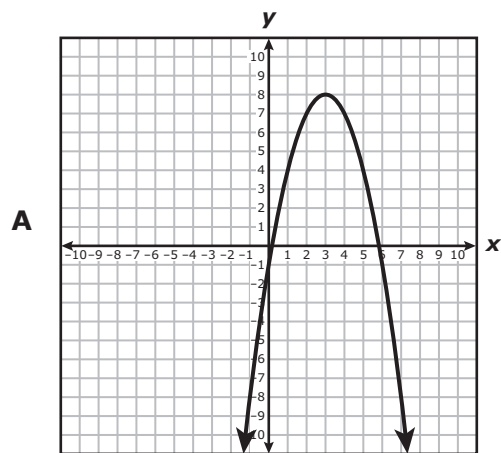
20 The graph of a linear function is shown on the grid.



What is the rate of change of  $y$  with respect to  $x$  for this function?

Record your answer and fill in the bubbles on your answer document.

21 Which graph best represents  $y = -x^2 + 6x - 1$ ?



- 22** A company advertises on a website. A worker tracked the number of visits to the website and the number of clicks on the advertisement. The table shows the data for several days. A linear function can be used to model the data.

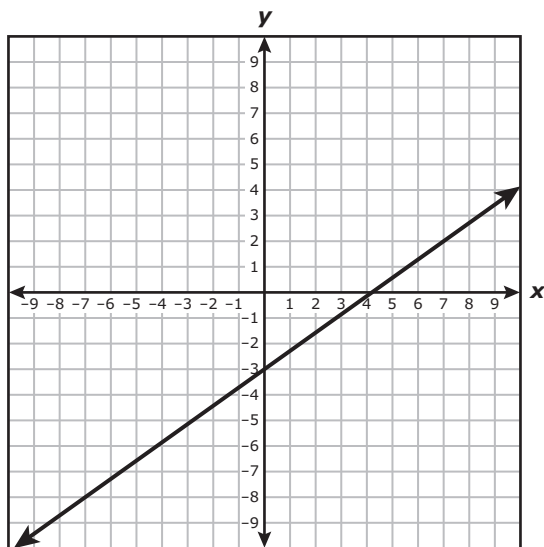
Website Advertisement

Number of Visits to Website, $x$	Number of Clicks on Advertisement, $y$
153	14
629	38
471	30
914	53
307	21
1,045	60
510	32
1,106	63

Based on the table, what is the best prediction of the number of clicks on the advertisement if 1,500 people visit the website?

- F** 77
- G** 137
- H** 83
- J** 105

23 The graph of a linear function is shown on the grid.



Which equation is best represented by this graph?

**A**  $y + 2 = \frac{7}{5}(x + 7)$

**B**  $y - 2 = \frac{7}{5}(x - 7)$

**C**  $y + 2 = \frac{5}{7}(x + 7)$

**D**  $y - 2 = \frac{5}{7}(x - 7)$

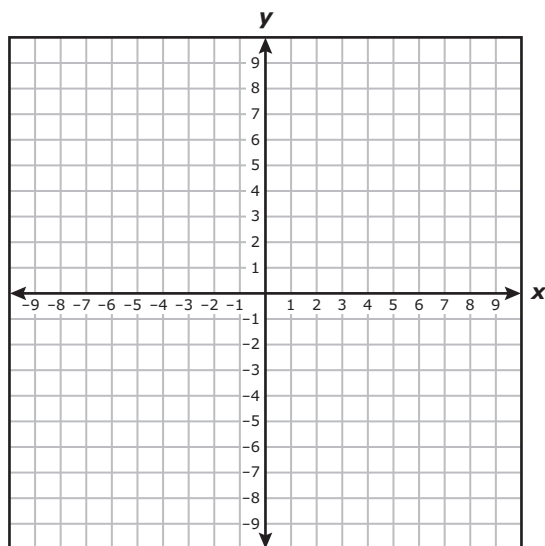
- 24** Which expression is equivalent to  $(xy^{-6})^2$  for all values of  $x$  and  $y$  where the expression is defined?
- F**  $xy^{-36}$
- G**  $xy^{36}$
- H**  $x^2y^{-12}$
- J**  $x^2y^{12}$
- 

- 25** A college student completed some courses worth 3 credits and some courses worth 4 credits. The student earned a total of 59 credits after completing 18 courses.

How many courses worth 3 credits did the student complete?

- A** 13
- B** 5
- C** 20
- D** 39

- 26 The graph of linear function  $f$  passes through the point  $(1, -9)$  and has a slope of  $-3$ .



What is the zero of  $f$ ?

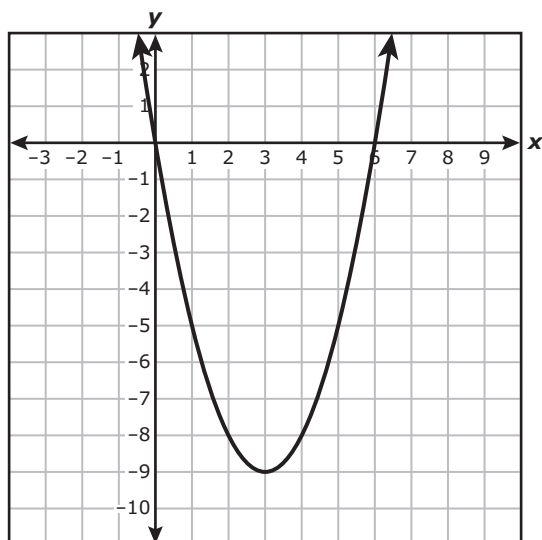
- F 2
- G 4
- H -6
- J -2

- 
- 27 What is the value of the  $y$ -intercept of the graph of  $h(x) = 29(5.2)^x$ ?

Record your answer and fill in the bubbles on your answer document.



28 The graph of a quadratic function is shown on the grid.



Which function is best represented by this graph?

**F**  $h(x) = x^2 - 3x - 9$

**G**  $h(x) = x^2 + 3x - 9$

**H**  $h(x) = x^2 - 6x$

**J**  $h(x) = x^2 + 6x$

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29 Which expression is equivalent to  $24x^2 - 22x + 5$ ?

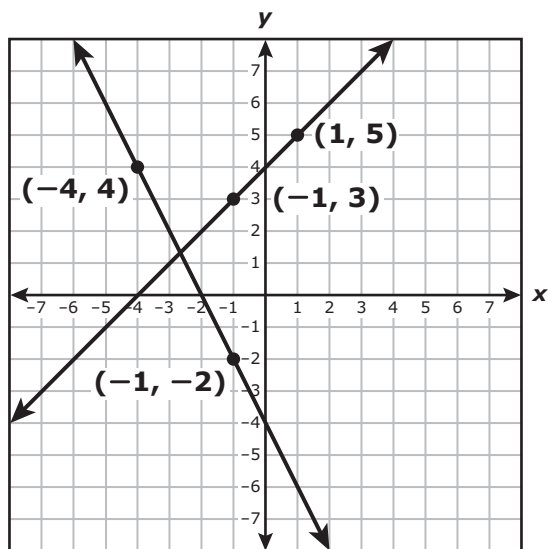
**A**  $(12x + 5)(2x + 1)$

**B**  $(8x - 5)(3x - 1)$

**C**  $(12x - 5)(2x - 1)$

**D**  $(8x + 5)(3x + 1)$

30 A system of equations is graphed on the grid.



Which system of equations does the graph represent?

- F**  $y = -x - 4$   
 $y = 2x - 2$
- G**  $y = -x + 4$   
 $y = 2x - 4$
- H**  $y = x - 4$   
 $y = -2x - 2$
- J**  $y = x + 4$   
 $y = -2x - 4$

**31** The table represents some points on the graph of an exponential function.

$x$	$f(x)$
-2	12.5
-1	15
0	18
1	21.6
2	25.92

Which function represents the same relationship?

**A**  $f(x) = 15\left(\frac{5}{6}\right)^x$

**B**  $f(x) = 18\left(\frac{6}{5}\right)^x$

**C**  $f(x) = 15\left(\frac{6}{5}\right)^x$

**D**  $f(x) = 18\left(\frac{5}{6}\right)^x$

- 32 The table shows the amount of pet food in cups remaining in an automatic feeder as a function of the number of meals the feeder has dispensed.

Automatic Feeder

Number of Meals Dispensed, $n$	Amount of Pet Food Remaining, $f(n)$ (cups)
1	21
3	15
6	6
7	3

Based on the table, which function models this situation?

F  $f(n) = -3n + 24$

G  $f(n) = -\frac{1}{3}n + 16$

H  $f(n) = -3n + 64$

J  $f(n) = -\frac{1}{3}n + 8$

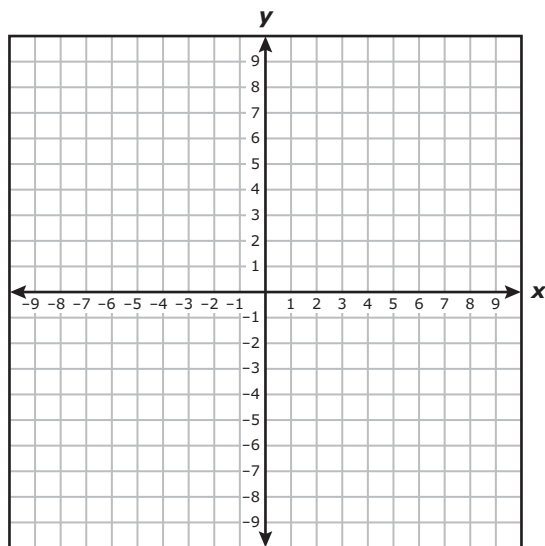
- 
- 33 The graph of  $f(x) = x^2$  was transformed to create the graph of  $g(x) = f(x) - 9$ . Which statement about the graphs is true?

- A The graph of  $g$  is a reflection of the graph of  $f$  across the  $x$ -axis.  
B The vertex of the graph of  $g$  is 9 units to the right of the vertex of the graph of  $f$ .  
C The graph of  $g$  is a reflection of the graph of  $f$  across the  $y$ -axis.  
D The  $y$ -intercept of the graph of  $g$  is 9 units below the  $y$ -intercept of the graph of  $f$ .

- 
- 34 The expression  $(x^{22})(x^7)^3$  is equivalent to  $x^p$ . What is the value of  $p$ ?

Record your answer and fill in the bubbles on your answer document.

- 35 The graph of linear function  $k$  passes through the points  $(-7, 0)$  and  $(1, 8)$ .



Which statement must be true?

- A The slope of the graph of  $k$  is  $-\frac{4}{3}$ .
- B The graph of  $k$  passes through the point  $(-1, -8)$ .
- C The zero of  $k$  is 7.
- D The x-intercept of the graph of  $k$  is  $-7$ .

**36** Which expression is equivalent to  $210d^2 - 63d$ ?

**F**  $21d(10d - 3)$

**G**  $21d(10d + 3)$

**H**  $21(10d + 3)$

**J**  $21(10d - 3)$

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**37** What is the value of  $x$  in the solution to this system of equations?

$$\begin{aligned}3x - 5y &= 22 \\ y &= -5x + 32\end{aligned}$$

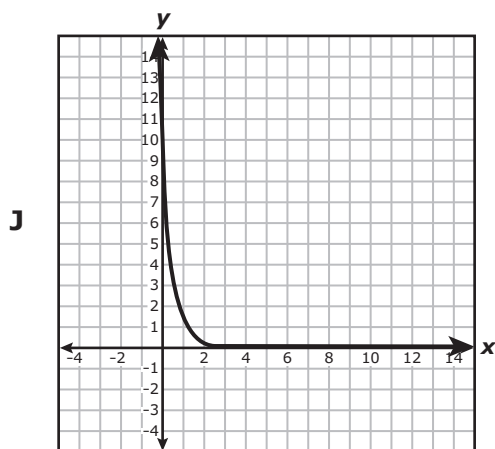
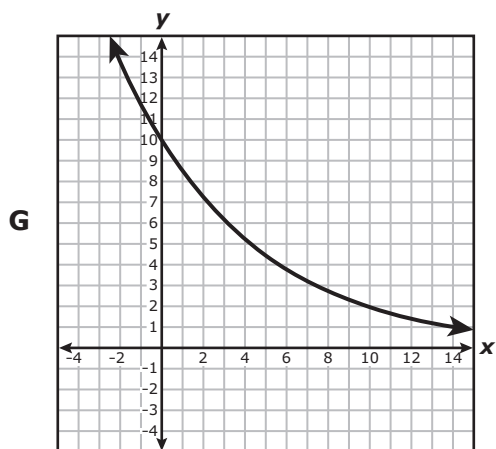
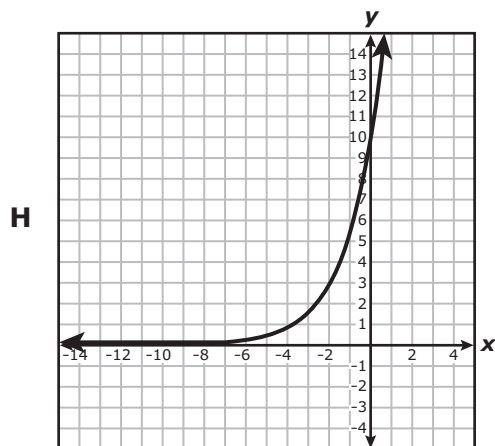
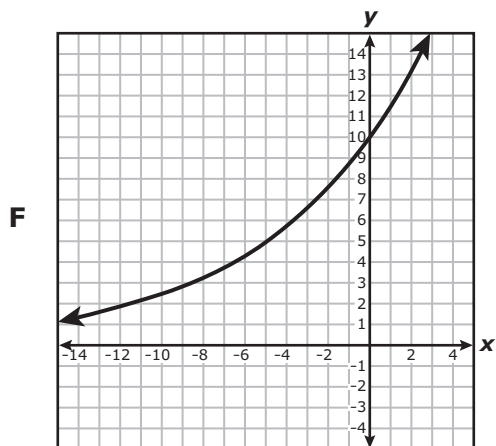
**A**  $-6.5$

**B**  $0.5$

**C**  $6.5$

**D**  $-0.5$

38 Which graph best represents  $y = 10(0.85)^x$ ?



39 The table shows a linear relationship between  $x$  and  $y$ .

$x$	$y$
-20	96
-12	60
-6	33
-2	15

What is the rate of change of  $y$  with respect to  $x$ ?

- A  $-\frac{9}{2}$
- B  $\frac{2}{9}$
- C  $-\frac{2}{9}$
- D  $\frac{9}{2}$

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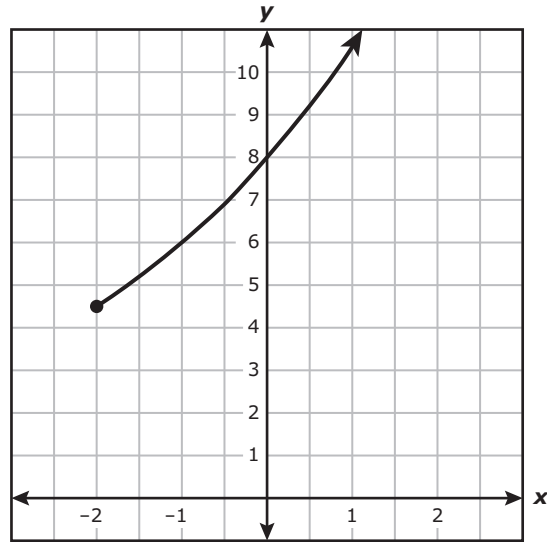
40 Which value of  $x$  is a solution to this equation?

$$5x^2 - 36x + 36 = 0$$

- F  $x = -6$
- G  $x = 4$
- H  $x = -1.8$
- J  $x = 1.2$



41 A part of an exponential function is graphed on the grid.



Which inequality best represents the domain of the part shown?

- A  $x \geq -2$
- B  $y \geq 4.5$
- C  $x \geq 4.5$
- D  $y \geq -2$

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42 What is the solution to  $-(6m + 8) = 4(17 - m)$ ?

Record your answer and fill in the bubbles on your answer document.

43 Which function is equivalent to  $y = 3(x + 2)^2 + 7$ ?

A  $y = 3x^2 + 12x + 33$

B  $y = 3x^2 + 12x + 19$

C  $y = 3x^2 + 19$

D  $y = 3x^2 + 33$

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44 Which table shows  $y$  as a function of  $x$ ?

F

$x$	-13	-13	-13	-13
$y$	-2	0	5	7

H

$x$	1	3	7	12
$y$	4	4	4	4

G

$x$	-6	-1	-1	10
$y$	3	-1	5	-9

J

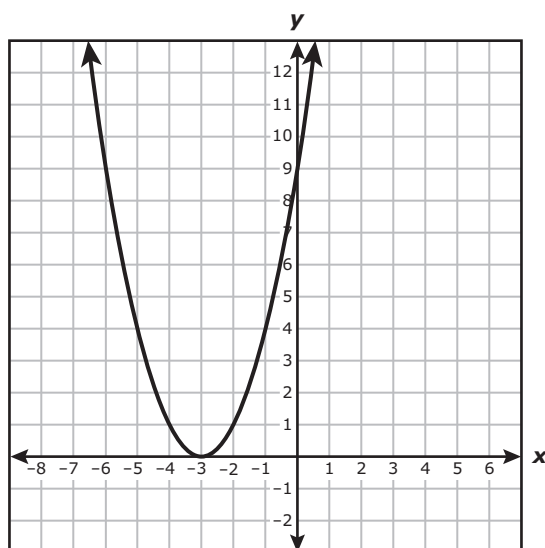
$x$	-9	-2	0	0
$y$	-7	-5	0	6

**45** What is the equation in slope-intercept form of the line that passes through the point  $(5, 0)$  and is parallel to the line represented by  $y = 1.2x + 3.8$ ?

- A**  $y = 1.2x - 6$
- B**  $y = -1.2x + 6$
- C**  $y = 1.2x + 5$
- D**  $y = -1.2x - 5$

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**46** The graph of quadratic function  $k$  is shown on the grid.

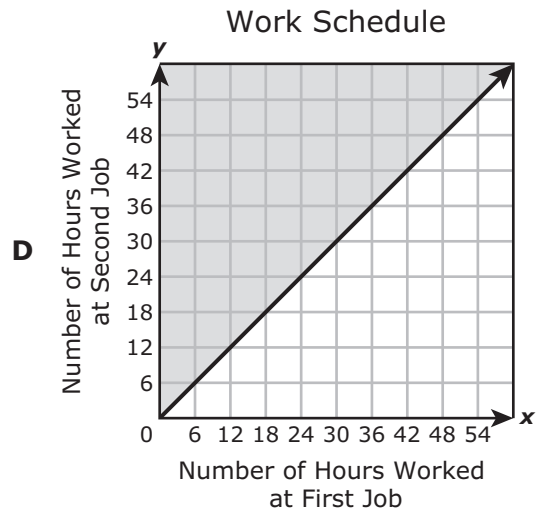
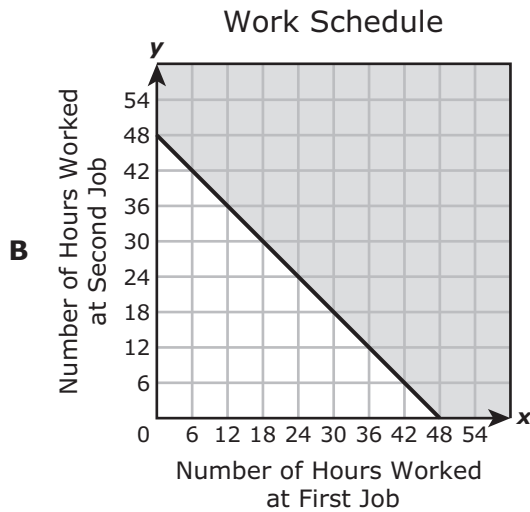
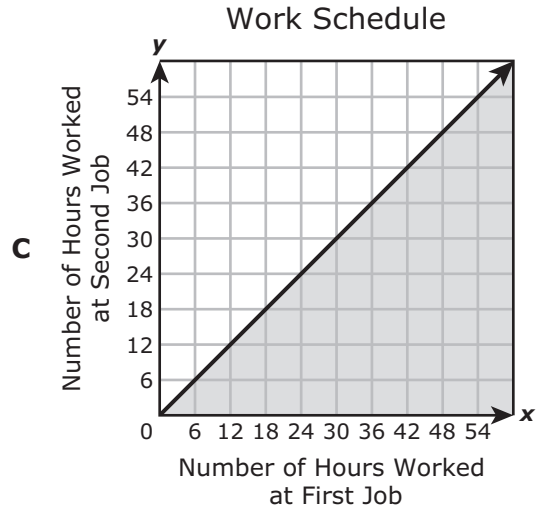
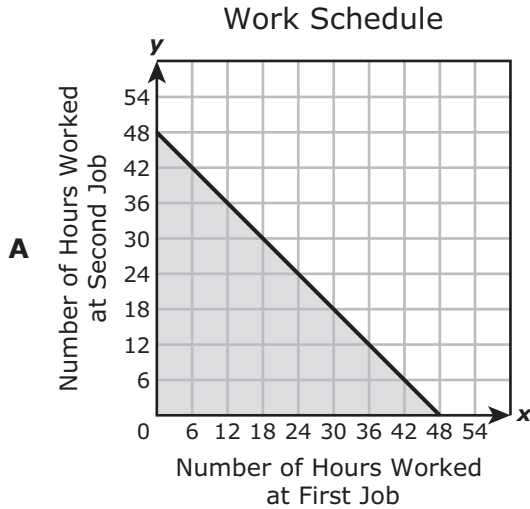


Which statements are best supported by the graph of  $k$ ?

- I. The  $x$ -intercept is located at  $(-3, 0)$ .
  - II. The coordinates of the  $y$ -intercept are  $(0, 9)$ .
  - III. The axis of symmetry is  $x = -3$ .
- F** I and II only
  - G** I and III only
  - H** II and III only
  - J** I, II, and III

- 47 A college student has two different jobs. Her combined work schedules consist of no more than 48 hours in one week.

Which graph best represents the solution set for all possible combinations of  $x$ , the number of hours she worked at her first job, and  $y$ , the number of hours she worked at her second job, in one week?



48 Which function is equivalent to  $q(x) = 9x^2 - 24x + 16$ ?

F  $q(x) = (9x - 4)(x - 4)$

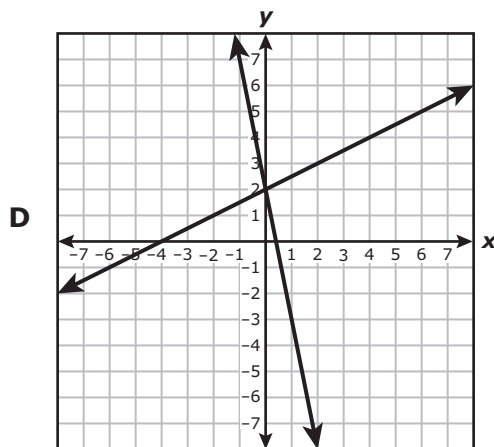
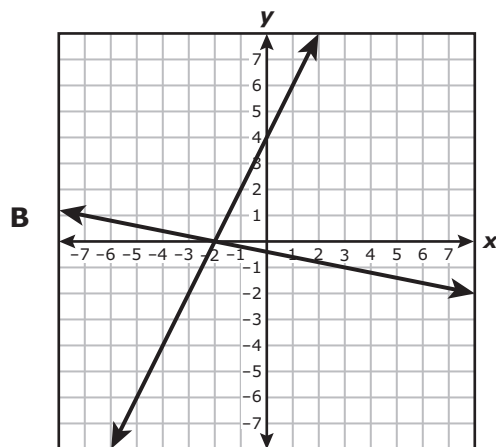
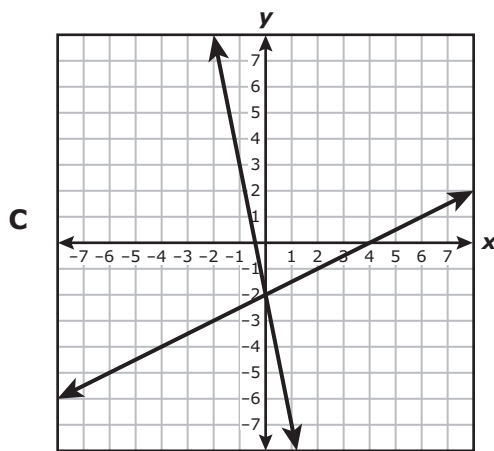
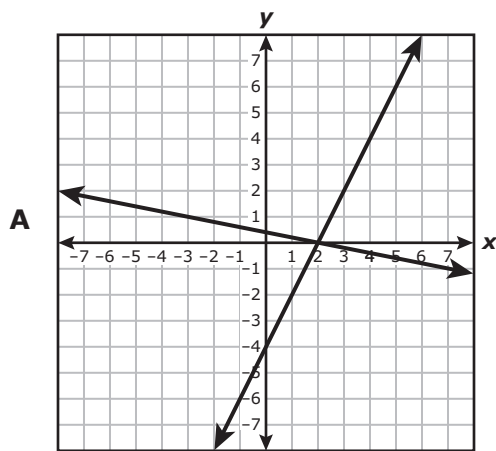
G  $q(x) = (3x + 4)^2$

H  $q(x) = (9x + 4)(x + 4)$

J  $q(x) = (3x - 4)^2$

49 Which graph best represents this system of equations and its solution?

$$\begin{aligned} 8x - 4y &= -16 \\ 3x + 15y &= -6 \end{aligned}$$



**50** What are the domain and range of  $g(x) = -\frac{1}{4}(x - 17)^2 + 61$ ?

**F** Domain: All real numbers  
Range:  $g(x) \leq 61$

**G** Domain:  $x \leq 17$   
Range:  $g(x) \leq 61$

**H** Domain: All real numbers  
Range:  $x \leq 17$

**J** Domain:  $g(x) \geq 61$   
Range:  $x \leq 17$

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**51** A customer at a store paid \$64 for 3 large candles and 4 small candles. At the same store, a second customer paid \$4 more than the first customer for 1 large candle and 8 small candles. The price of each large candle is the same, and the price of each small candle is the same.

Which system of equations can be used to find the price in dollars of each large candle,  $x$ , and each small candle,  $y$ ?

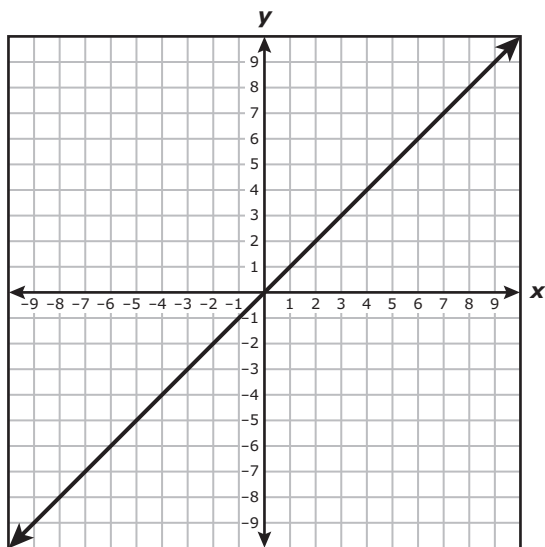
**A**  $4y = 3x + 64$   
 $8y = x + 68$

**B**  $4y = 3x + 64$   
 $8y = x + 60$

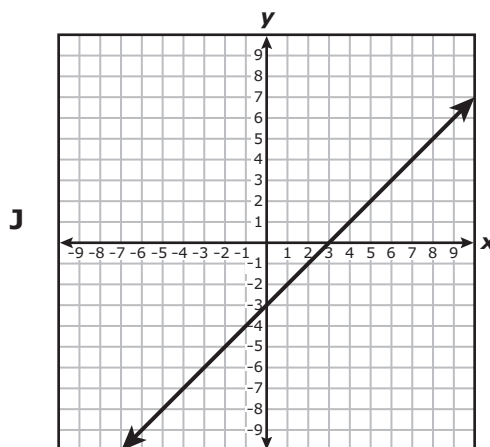
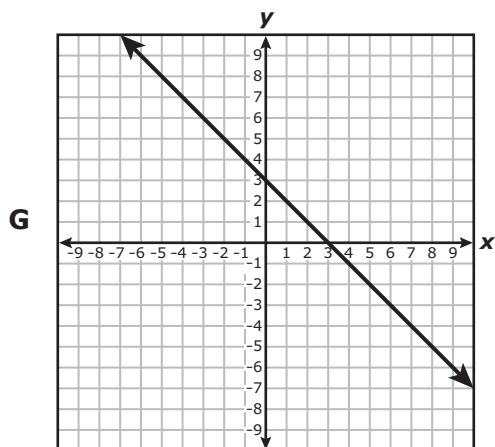
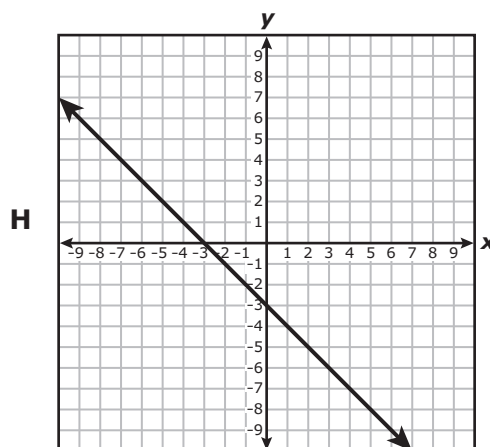
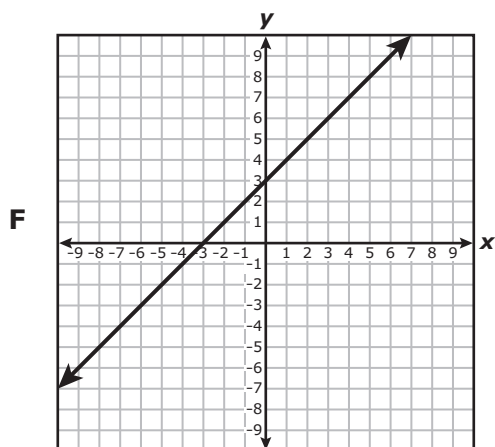
**C**  $3x + 4y = 64$   
 $x + 8y = 68$

**D**  $3x + 4y = 64$   
 $x + 8y = 60$

52 Linear parent function  $f$  is graphed on the grid.



Which graph best represents  $h(x) = -f(x) + 3$ ?



**53** Which expression is equivalent to  $4\sqrt{147}$ ?

**A**  $196\sqrt{3}$

**B**  $12\sqrt{7}$

**C**  $3\sqrt{7}$

**D**  $28\sqrt{3}$

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**54** The total distance in centimeters a toy robot moves varies directly with the time in seconds. The toy robot moves a total distance of 264 centimeters in 11 seconds.

What is the time in seconds the toy robot moves when the total distance is 408 centimeters?

**F** 24 s

**G** 17 s

**H** 13 s

**J** 37 s











**STAAR  
Algebra I  
May 2019**

