STAAR®

State of Texas Assessments of Academic Readiness

Algebra II

Administered May 2013

RELEASED

STAAR ALGEBRA II
REFERENCE MATERIALS

GENERAL FORMULAS

Slope of a line
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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

FACTORING

Difference of squares
$$a^2 - b^2 = (a - b)(a + b)$$

Difference of cubes
$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Sum of cubes
$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

LOGARITHMS

Product
$$\log_b(xy) = \log_b x + \log_b y$$

Quotient
$$\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$$

Power
$$\log_b(x^r) = r \log_b x$$

CONIC SECTIONS

General form
$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$$

Circle
$$(x - h)^2 + (y - k)^2 = r^2$$

Parabola
$$(x - h)^2 = 4p(y - k) \qquad (y - k)^2 = 4p(x - h)$$

Ellipse
$$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1 \qquad \frac{(y - k)^2}{a^2} + \frac{(x - h)^2}{b^2} = 1$$

Hyperbola
$$\frac{(x - h)^2}{a^2} - \frac{(y - k)^2}{b^2} = 1 \qquad \frac{(y - k)^2}{a^2} - \frac{(x - h)^2}{b^2} = 1$$

STAAR ALGEBRA II
REFERENCE MATERIALS

CIRCUMFERENCE

Circle	$C = 2\pi r$	or	$C = \pi d$

AREA

Triangle	$A = \frac{1}{2}bh$
Rectangle or parallelogram	$A = bh$
Rhombus	$A = \frac{1}{2}d_1 d_2$
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$
Regular polygon	$A = \frac{1}{2}aP$
Circle	$A = \pi r^2$

SURFACE AREA

	Lateral	Total
Prism	$S = Ph$	$S = Ph + 2B$
Pyramid	$S = \frac{1}{2}Pl$	$S = \frac{1}{2}Pl + B$
Cylinder	$S = 2\pi rh$	$S = 2\pi rh + 2\pi r^2$
Cone	$S = \pi rl$	$S = \pi rl + \pi r^2$
Sphere		$S = 4\pi r^2$

VOLUME

Prism or cylinder	$V = Bh$
Pyramid or cone	$V = \frac{1}{3}Bh$
Sphere	$V = \frac{4}{3}\pi r^3$
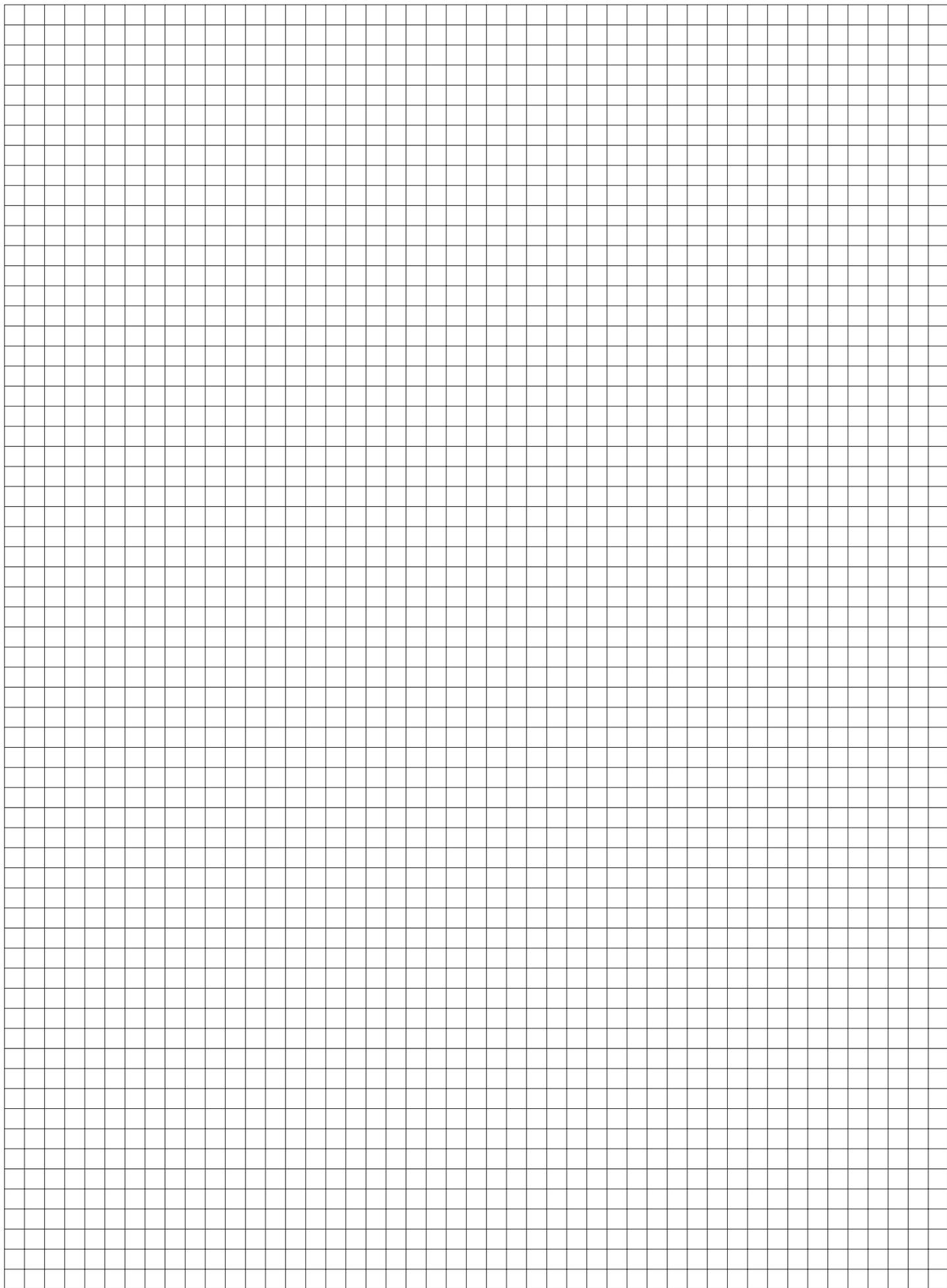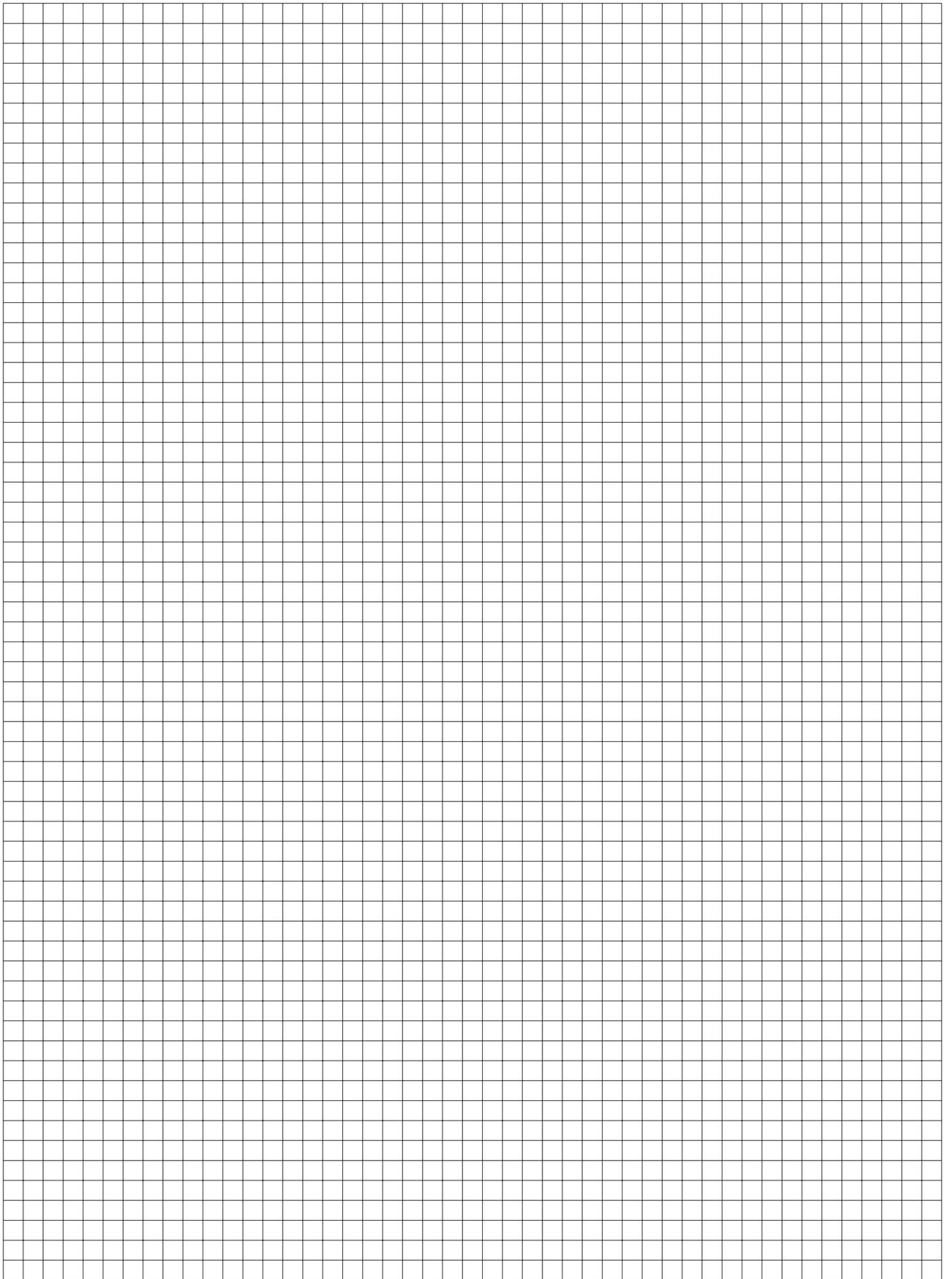
Algebra II

1   Some values for the function $f(x) = \log x$ are given in Table 1.

Table 1

x	f(x)
10	1
100	2
1,000	3
10,000	4

Table 2

x	g(x)
1	10
2	100
3	1,000
4	10,000

Which function can generate all the values in Table 2?

A $g(x) = x^{10}$

B $g(x) = 10^x$

C $g(x) = \dfrac{10}{x}$

D $g(x) = 10x$

2   For what value of c will the graphs of $y = 2x^2 - 36x + c$ and $y = 2(x - 9)^2 - 18$ be the same?

F   63

G   −180

H   99

J   144

GO ON

3   The rectangular patio shown in the diagram below is enclosed on three sides by a fence.
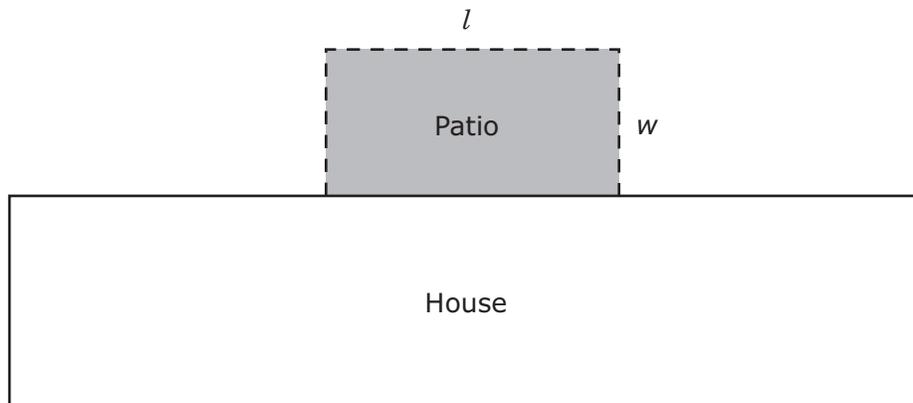
The area of this patio is no more than 400 square feet. The total length of the three sides of this fence is no more than 60 feet. Which system of inequalities can be used to find values of l, the patio's length, and w, the patio's width, that will satisfy these conditions?

A $l + 2w \leq 60$
$lw \leq 400$

B $2l + 2w \leq 60$
$lw \leq 400$

C $l + 2w \geq 60$
$lw \geq 400$

D $2l + 2w \geq 60$
$lw \geq 400$

4 The graph of the quadratic function f is shown on the grid below.
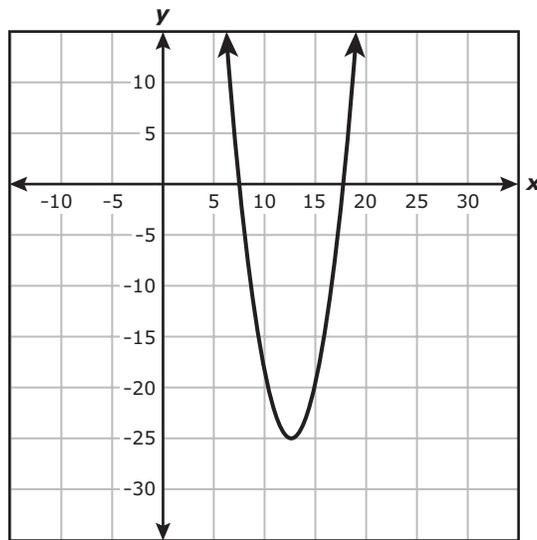
What does the solution set for $f(x) = 0$ appear to be?

F $\{12.5\}$

G $\{12.5, -25\}$

H $\{7.5, 17.5\}$

J $\{7.5, 12.5, 17.5\}$

---

5 The cost of printing cookbooks is $2.09 per book plus a one-time setup fee of $349. All taxes are included. Which of the following functions models $a(x)$, the average cost per book of printing x cookbooks?

A $a(x) = 2.09x + \dfrac{349}{x}$

B $a(x) = \dfrac{2.09x + 349}{x}$

C $a(x) = \dfrac{2.09 + 349}{2.09x}$

D $a(x) = \dfrac{2.09x + 349}{2.09x}$

6 Which graph best represents the parent function of $y = 4^{(x+3)}$?

F

H

G

J
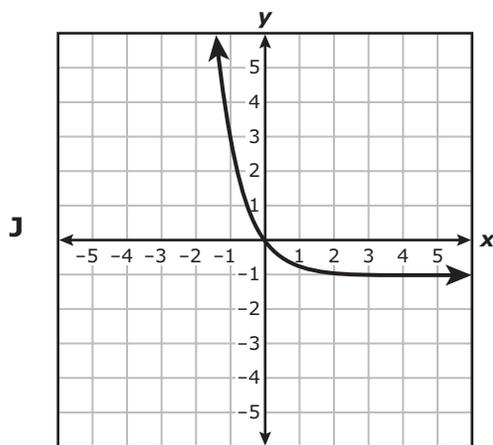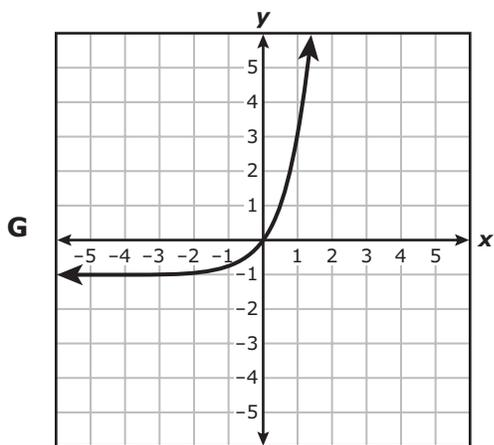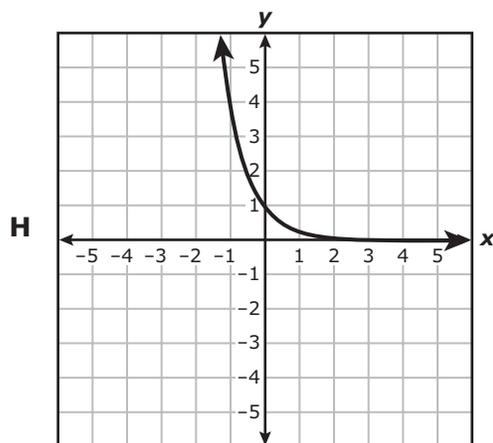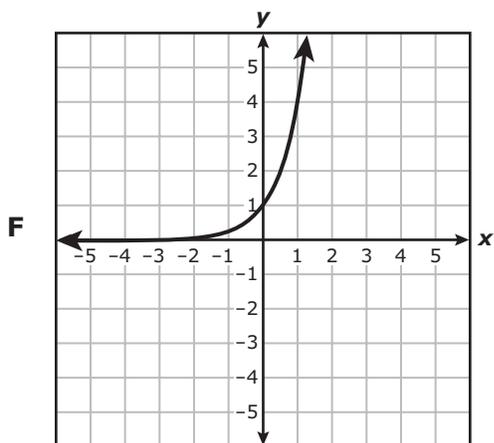
7 There were 417 cell phones sold at an electronics store in January. Since then, cell phone sales at this store have increased at a rate of 3.75% per month. At this rate of growth, which function can be used to determine the monthly cell phone sales m months after January?

A $p(m) = 417(0.0375)^m$

B $p(m) = 417(1.0375)^m$

C $p(m) = 417(0.9625)^{(m+1)}$

D $p(m) = 417(0.0375)^{(m+1)}$

Page 12

8   The graph of the function *f* is shown on the grid below.
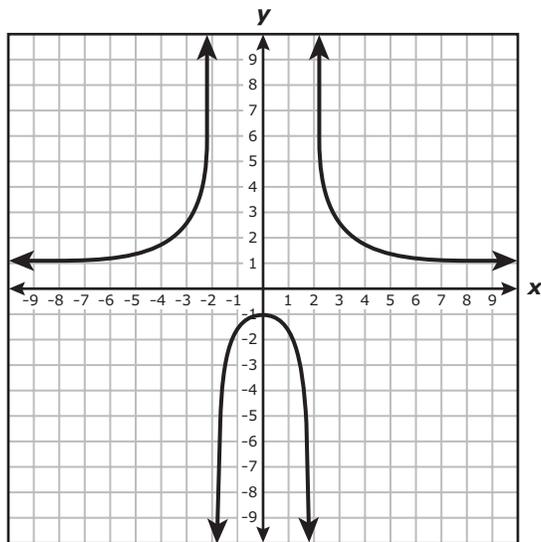
Based on the graph, for what values of *x* is $f(x) > 0$?

F   All real numbers greater than 0

G   All real numbers greater than 1

H   All real numbers less than −2 or greater than 2

J   All real numbers greater than −2 and less than 2

---

9   The sum of a number, *n*, and its square root can be represented by the equation $y = n + \sqrt{n}$. If $y = 20$, which of the following is true?

A $n = 16$

B $n = 4$

C $n = 16$ and $n = 25$

D $n = 4$ and $n = 5$

10 The graph of the function h was obtained from the graph of the function g using a composite transformation, as shown below.
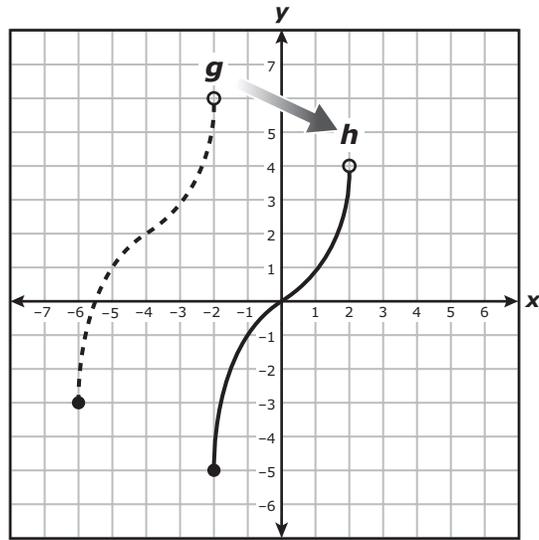
Which equation can be used to describe $h(x)$ in terms of $g(x)$?

F $h(x) = g(x + 4) + 2$

G $h(x) = g(x + 4) - 2$

H $h(x) = g(x - 4) - 2$

J $h(x) = g(x - 4) + 2$

11 A craftsman wants to spend less than $300 on supplies for making bracelets and necklaces. Supplies for 1 bracelet cost $4, and supplies for 1 necklace cost $9. This relationship is shown in the graph below.

Jewelry Supplies
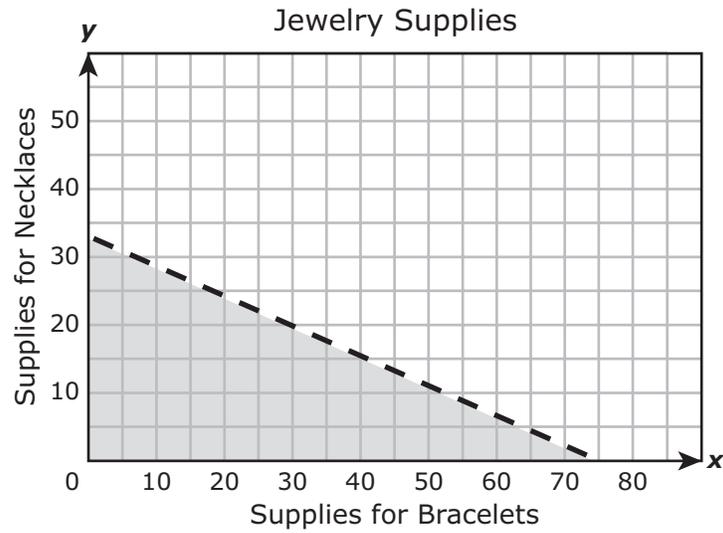
The craftsman wants to make at least 10 more bracelets than necklaces. Which of the following is a reasonable solution?

A 25 bracelets and 20 necklaces

B 30 bracelets and 15 necklaces

C 40 bracelets and 20 necklaces

D 15 bracelets and 25 necklaces

12 Which function's graph has a vertex at (3, 5) and contains the point (5, 13)?

F $y = \dfrac{1}{10}(x + 3)^2 - 5$

G $y = \dfrac{1}{10}(x - 3)^2 - 5$

H $y = 2(x - 3)^2 + 5$

J $y = 2(x + 3)^2 + 5$

---

13 What value of p makes the equation below true?

$$\frac{19}{4p - 1} = 5$$

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

Page 16

14 An equation in the form $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ is graphed below.
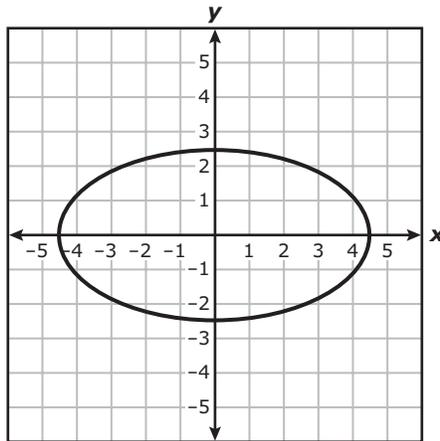
If the values of a and b remain the same, which graph best represents $\dfrac{x^2}{b^2} + \dfrac{y^2}{a^2} = 1$?

F

H

G

J

GO ON

15 An object is launched into the air. The table below shows the object's height above the ground at various times.

Height vs. Time

Elapsed Time (seconds)	Height Above the Ground (meters)
1	78
2	109
3	131
4	143
5	145
6	137

Based on the data in the table, which of the following is closest to the object's height above the ground 9 seconds after being launched?

A 110 m

B 55 m

C 10 m

D 95 m

16 A quadratic function is graphed on the grid below.
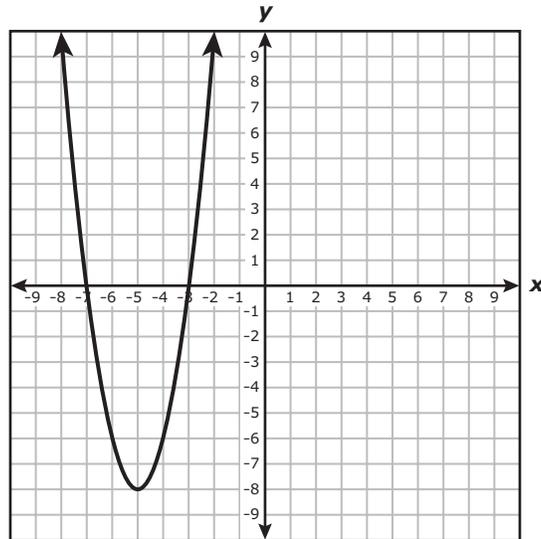
If this function is written in the form $y = a(x - h)^2 + k$, what is the value of a?

F -3

G -8

H 5

J 2

17 Which two transformations can be used to obtain the graph of $g(x) = -\sqrt{x - c}$ from the graph of $f(x) = \sqrt{x}$ if $c > 0$?

    A A translation to the right c units followed by a reflection across the x-axis

    B A translation to the left c units followed by a reflection across the x-axis

    C A translation to the right c units followed by a reflection across the y-axis

    D A translation to the left c units followed by a reflection across the y-axis

---

18 Which of the following is a solution to $10x^2 - x = 3$?

    F $-\dfrac{1}{5}$

    G $\dfrac{3}{5}$

    H $-\dfrac{3}{2}$

    J $\dfrac{1}{2}$

19 What is the *x*-value of the solution to the system of equations below?

$$x + y + z = 8$$
$$x + 2y = 6$$
$$y + z = 4$$

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

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20 The function below can be used to model the area of a rectangle in square inches, *A*, if the rectangle has a perimeter of 72 inches and a width of *w* inches.

$$A = 36w - w^2$$

In this situation, which of the following best describes the domain of the function?

F $0 < w < 6$

G $0 < w < 72$

H $0 < w < 18$

J $0 < w < 36$

GO ON

21 What is the inverse of $h(x) = \frac{1}{2}\log_3(x)$?

A $h^{-1}(x) = 3^{(2x)}$

B $h^{-1}(x) = 2(3)^x$

C $h^{-1}(x) = 2(\log_x 3)$

D $h^{-1}(x) = \log_3(2x)$

22 A table of values for the quadratic function *g* is shown below.

x	g(x)
−1	−55
2	−16
5	5
6	8
9	5
10	0
12	−16
14	−40

Which of the following statements about the graph of *g* are true?

    I. The graph has a line of symmetry at $x = 7$.
    II. The graph has a *y*-intercept at (0, −40).
    III. The graph has an *x*-intercept at (4, 0).
    IV. The graph has a vertex at (6, 8).

F I and II only

G III and IV only

H I, II, and III only

J I, II, III, and IV

---

23 The product of 2 consecutive odd integers is 483. If *x* represents the smaller integer, which equation can be used to find both integers?

A $x(x + 2) = 483$

B $x(x + 1) = 483$

C $x(x + 3) = 483$

D $(x + 1)(x + 2) = 483$

GO ON

24 If 5 is an element in the domain of $f(x) = \dfrac{7x - 22}{4}$, what is the corresponding element in the range?

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

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25 The roots of a quadratic equation are given by the expression below.

$$\frac{-25 \pm \sqrt{-100}}{25}$$

Which of the following is an equivalent expression?

A $-1 \pm \dfrac{2i}{5}$

B $-1 \pm 2i$

C $-25 \pm \dfrac{2i}{5}$

D $-25 \pm 2i$

26 An antibiotic is introduced into a colony of 12,000 bacteria during a laboratory experiment. The function below can be used to model the number of bacteria in the colony after *m* minutes.

$$n(m) = 12{,}000(0.851)^{\frac{m}{10}}$$

Which value is closest to the amount of time needed for the population of the colony to drop to 8,000 bacteria?

F 11 min

G 25 min

H 8 min

J 42 min

---

27 The table below shows values of a quadratic function *g*.

x	g(x)
−5	−11
−4	8
−3	21
−2	28
−1	29
0	24
1	13
2	−4
3	−27

Based on the table, in which interval can a solution to $g(x) = 0$ be found?

A $-5 < x < -4$

B $-2 < x < -1$

C $-1 < x < 1$

D $2 < x < 3$

GO ON

28 The given function models the equivalent resistance in ohms, R, when a fixed 9-ohm resistor is connected in parallel with a variable resistor of x ohms.

$$R = \frac{9x}{9 + x}$$

Which value of x is closest to the number of ohms needed in the variable resistor for there to be an equivalent resistance, R, of 6.4 ohms?

F 15.4

G 57.6

H 3.7

J 22.2

29 For the functions h and g, which statement is true if $h(x) = g(x + 14) - 12$?

A The graph of h is the result of the graph of g being translated right 14 units and down 12 units.

B The graph of h is the result of the graph of g being translated left 14 units and down 12 units.

C The graph of h is the result of the graph of g being translated right 14 units and up 12 units.

D The graph of h is the result of the graph of g being translated left 14 units and up 12 units.

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30 The graph of the exponential function f is shown on the grid below.
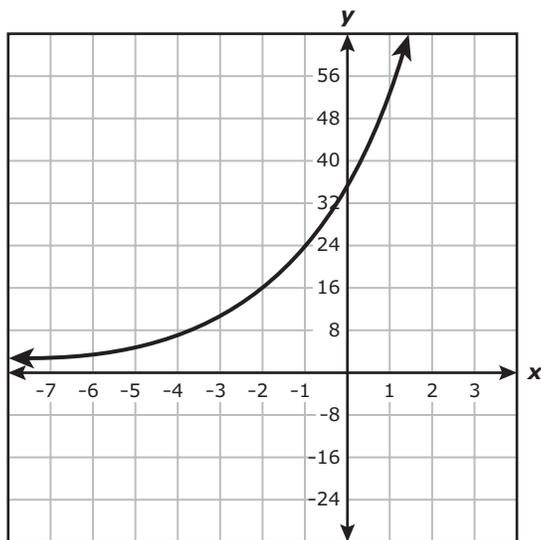
For what values of x is $f(x) > 16$?

F $x > -2$

G $x > 0$

H $-2 < x < 2$

J $\infty < x < -2$

GO ON

31 What value of n makes $\sqrt{10 - 3n} = 7$ true?

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

---

32 Which equation has the same graph as $2x^2 - 4x - y + 11 = 0$?

F $y = (2x - 1)^2 + 9$

G $y = (2x - 1)^2 + 13$

H $y = 2(x - 1)^2 + 9$

J $y = 2(x - 1)^2 + 13$

33 A sector of a circle is shown below.
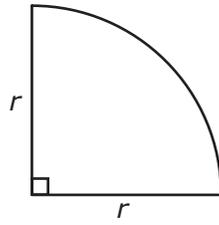
The area, A, of the sector is $\frac{\pi}{4}$ times the square of the radius, r. Which graph represents this relationship?

A

B

C

D
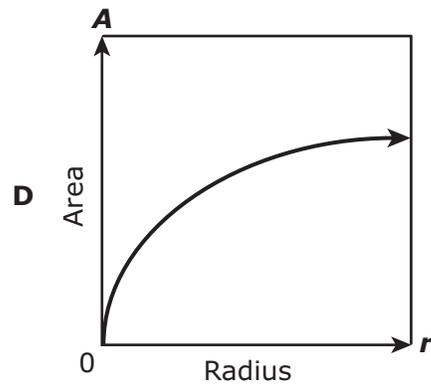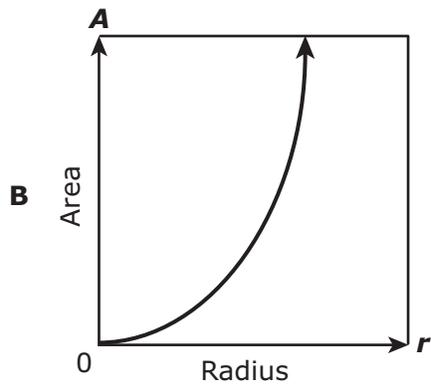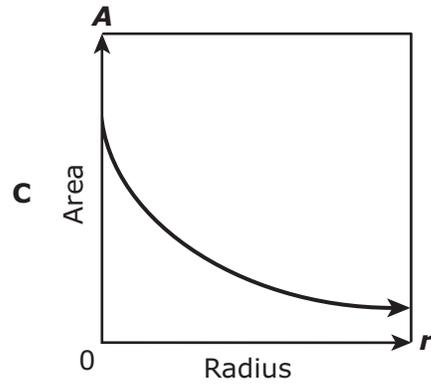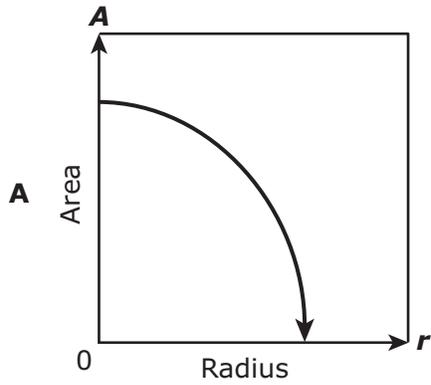
34 The hypotenuse of a right triangle is 17 inches long. A leg of this triangle, y, is 1 inch less than twice the length of the other leg, x. Which system of equations can be used to determine the lengths of the 2 legs of this right triangle in inches?

F $x^2 + y^2 = 289$
$y = 2x - 1$

G $x^2 + y^2 = 289$
$2x + y = 1$

H $x + y = 17$
$y = 2x - 1$

J $x + y = 17$
$2x + y = 1$

---

35 What is the solution set for $x^2 + 4 = 6x$?

A $\left\{ -3 \pm i\sqrt{14} \right\}$

B $\left\{ -3 \pm \sqrt{5} \right\}$

C $\left\{ 3 \pm i\sqrt{14} \right\}$

D $\left\{ 3 \pm \sqrt{5} \right\}$

36 A plane intersects a double cone as shown below.
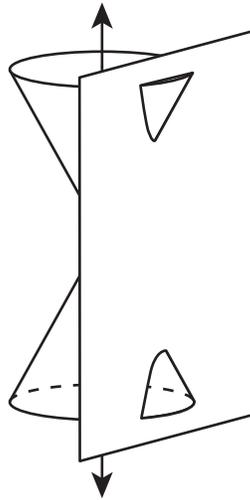
What conic section is created by this intersection?

F Circle

G Ellipse

H Hyperbola

J Parabola

---

37 Each year an architecture firm employs senior interns and junior interns. Senior interns receive $400 per week, and junior interns receive $300 per week. This year a minimum of 7 but no more than 13 interns will be hired. The amount spent per week on interns cannot exceed $4,000. Which statement about this situation is not true?

A The architecture firm can employ 13 junior interns.

B The architecture firm can employ 4 senior interns and 7 junior interns.

C If both types of interns are hired, the firm will spend a minimum of $2,200 per week on interns.

D If both types of interns are hired, the firm will spend a maximum of $3,800 per week on interns.

38 Which table contains only values in the solution set for $y \le \sqrt{25 - x} + 11$?

F

x	y
−24	19
−11	17
9	10
24	9

H

x	y
−24	19
−11	18
9	−18
24	−19

G

x	y
−24	18
−11	16
9	11
24	9

J

x	y
−24	9
−11	10
9	15
24	17

---

39 What is the solution set for the following equation?

$$3\left|1 - \frac{1}{4}x\right| = 9$$

A $\left\{-\dfrac{1}{2}, \dfrac{1}{2}\right\}$

C $\{-8, 16\}$

B $\left\{-\dfrac{1}{2}, 1\right\}$

D $\{-8, -16\}$

GO ON

40 For what value of b will $f(x) = x^2 + bx + 400$ have -20 as its only zero?

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

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41 Which function is equivalent to its inverse?

A $f(x) = \dfrac{2x - 1}{2}$

B $g(x) = \dfrac{3 - x}{3}$

C $h(x) = 7 - x$

D $j(x) = x - 4$

42 Which of the following gives the equations for all the vertical asymptotes of the graph of

$$f(x) = \frac{x + 4}{(x + 8)(x - 5)}?$$

F $x = -4$

G $x = -5$ and $x = 8$

H $x = -2$ and $x = 5$

J $x = -8$ and $x = 5$

---

43 What is the range of $f(x) = x^2 + 1$?

A   All real numbers

B   All real numbers greater than or equal to 0

C   All real numbers greater than or equal to 1

D   All real numbers less than or equal to 1

**44** Which of the following ordered pairs is a solution to the system of inequalities given below?

$$x + y < 4$$
$$x^2 + y < 8$$

F (1, 5)

G (1, 2)

H (4, −1)

J (−4, −1)

---

45 A rectangular parking lot measures 150 feet by 230 feet. The owner of the parking lot will expand the lot's size by adding x feet and $2x$ feet to its dimensions, as shown below.
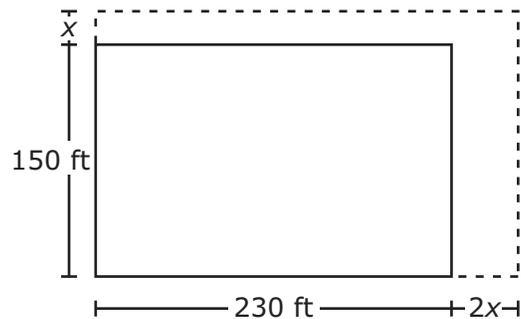

If the total area of the parking lot cannot exceed 40,000 square feet, which inequality can be used to find all possible values of x?

A $(230 + 2x)(150 + x) \leq 40{,}000$

B $(230 + x)(150 + 2x) \leq 40{,}000$

C $(230 + 2x)(150 + x) \geq 40{,}000$

**D** $(230 + x)(150 + 2x) \geq 40{,}000$

46 Which type of transformation can be used to obtain the graph of $g(x) = 4(2^x)$ from the graph of $f(x) = 2^x$?

    F Vertical shrink

    G Vertical shift down

    H Vertical shift up

    J Vertical stretch

---

47 What is the greatest value in the domain of the function graphed below?
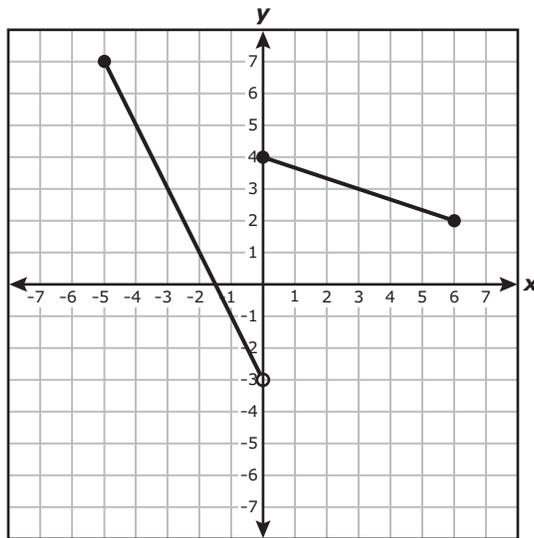
    A 2

    B 6

    C 4

    D 7

48 A function is graphed below.
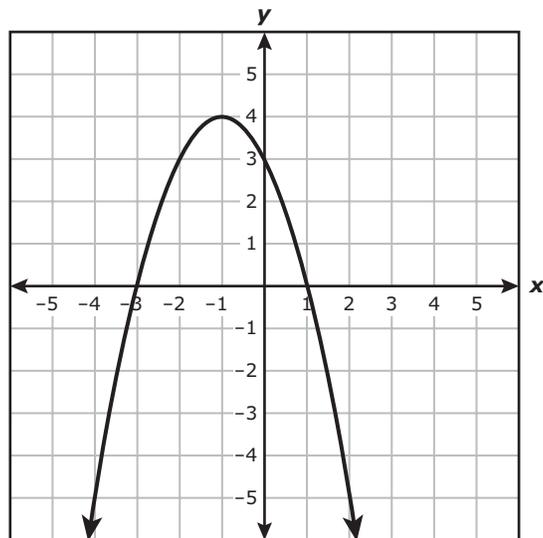
Which function is best represented by this graph?

F $y = -(x + 1)^2 + 4$

G $y = -(x - 1)^2 + 4$

**H** $y = -x^2 + 4x + 3$

J $y = -x^2 - 4x + 3$

---

49 The average speed of sound in air at t degrees Celsius can be found using the function below. The speed, s, is measured in meters per second.

$$s = 20.05\sqrt{t + 273.15}$$

If sound is traveling in air at an average speed of 356.5 meters per second, which temperature is closest to the value of t?

A 76°C

B 503°C

C 43°C

D 309°C

Page 37
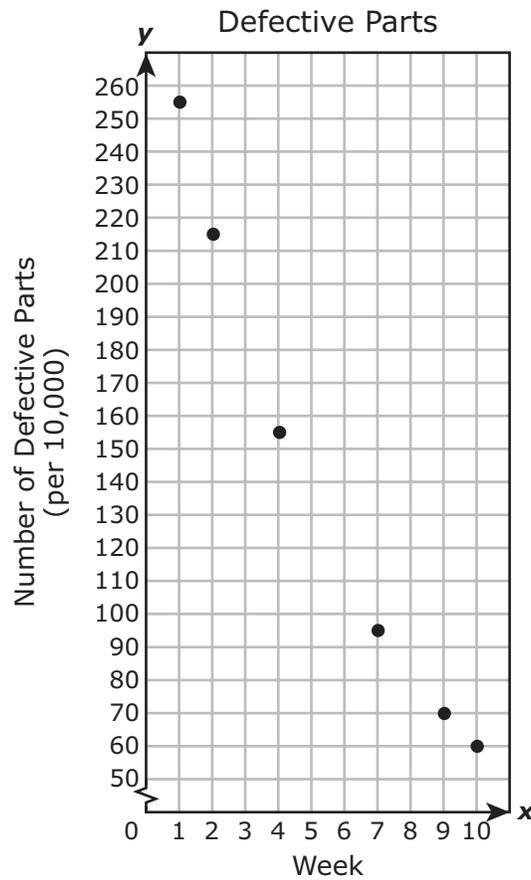
Defective Parts

A factory began producing new parts. Data were collected on the number of defective parts per 10,000 parts produced. The graph shown displays some of the data for the first 10 weeks of production. Based on the graph, during which week were approximately 130 defective parts per 10,000 produced?

F Week 3

G Week 5

H Week 6

J Week 8

BE SURE YOU HAVE RECORDED ALL OF YOUR ANSWERS
ON THE ANSWER DOCUMENT.

STOP

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Algebra II
May 2013