Algebra 2 Honors Summer Assignment

Name: _____ **Date:** _____

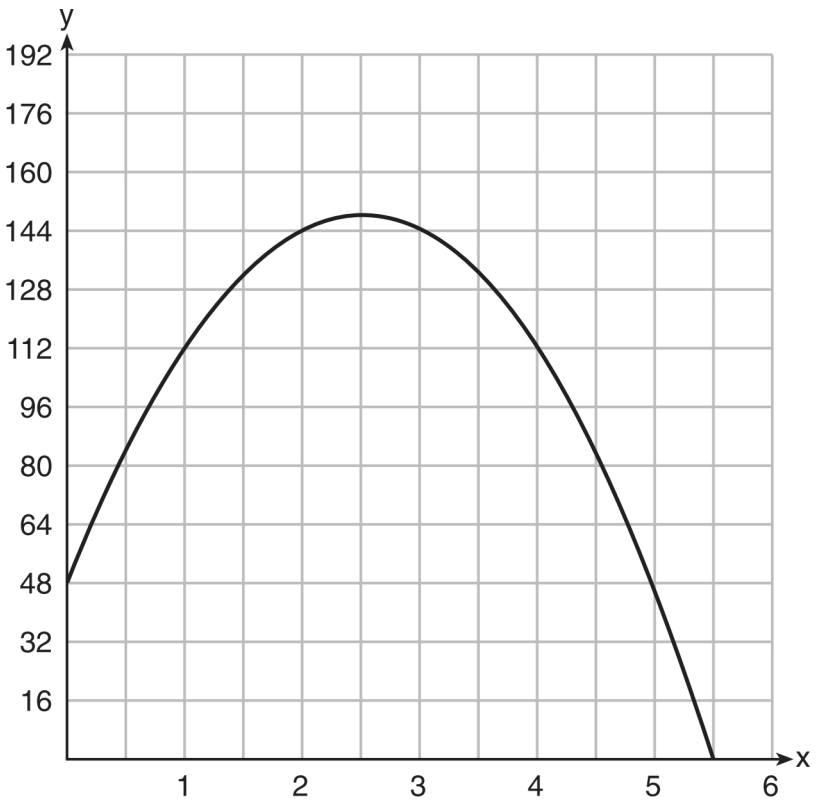
1. The table below shows the average yearly balance in a savings account where interest is compounded annually. No money is deposited or withdrawn after the initial amount is deposited.

Year	Balance, in Dollars
0	380.00
10	562.49
20	832.63
30	1232.49
40	1824.39
50	2700.54

Which type of function best models the given data?

A. linear function with a negative rate of change
B. linear function with a positive rate of change
C. exponential decay function
D. exponential growth function

2. A ball is thrown into the air from the edge of a 48-foot-high cliff so that it eventually lands on the ground. The graph below shows the height, y, of the ball from the ground after x seconds.



For which interval is the ball's height always *decreasing*?

A. $0 \leq x \leq 2.5$
B. $0 < x < 5.5$
C. $2.5 < x < 5.5$
D. $x \geq 2$

3. Which equation has the same solution as $x^2 - 6x - 12 = 0$?

A. $(x + 3)^2 = 21$ B. $(x - 3)^2 = 21$ C. $(x + 3)^2 = 3$ D. $(x - 3)^2 = 3$

4. What are the roots of the equation $x^2 + 4x - 16 = 0$?

A. $2 \pm 2\sqrt{5}$ B. $-2 \pm 2\sqrt{5}$ C. $2 \pm 4\sqrt{5}$ D. $-2 \pm 4\sqrt{5}$

5. Which system of equations has the same solution as the system below?

$$\begin{aligned} 2x + 2y &= 16 \\ 3x - y &= 4 \end{aligned}$$

A. $\begin{aligned} 2x + 2y &= 16 \\ 6x - 2y &= 4 \end{aligned}$ B. $\begin{aligned} 2x + 2y &= 16 \\ 6x - 2y &= 8 \end{aligned}$ C. $\begin{aligned} x + y &= 16 \\ 3x - y &= 4 \end{aligned}$ D. $\begin{aligned} 6x + 6y &= 48 \\ 6x + 2y &= 8 \end{aligned}$

6. The table below represents the function F.

x	3	4	6	7	8
$F(x)$	9	17	65	129	257

The equation that represents this function is

A. $F(x) = 3^x$ B. $F(x) = 3x$ C. $F(x) = 2^x + 1$ D. $F(x) = 2x + 3$

7. A sunflower is 3 inches tall at week 0 and grows 2 inches each week.

Which function(s) shown below can be used to determine the height, $f(n)$, of the sunflower in n weeks?

I. $f(n) = 2n + 3$

II. $f(n) = 2n + 3\,(n - 1)$

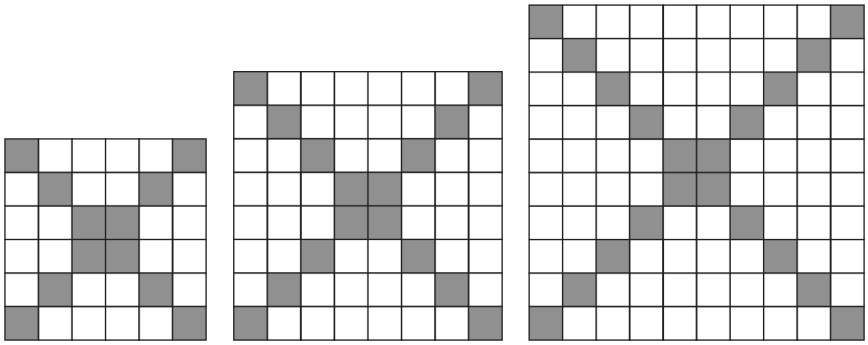
III. $f(n) = f(n - 1) + 2$ where $f(0) = 3$

A. I and II B. II, only C. III, only D. I and III

8. The formula for the volume of a cone is $V = \frac{1}{3}\pi r^2 h$. The radius, r, of the cone may be expressed as

A. $\sqrt{\frac{3V}{\pi h}}$ B. $\sqrt{\frac{V}{3\pi h}}$ C. $3\sqrt{\frac{V}{\pi h}}$ D. $\frac{1}{3}\sqrt{\frac{V}{\pi h}}$

9. The diagrams below represent the first three terms of a sequence.



Term 1 Term 2 Term 3

Assuming the pattern continues, which formula determines a_n, the number of shaded squares in the nth term?

A. $a_n = 4n + 12$ B. $a_n = 4n + 8$ C. $a_n = 4n + 4$ D. $a_n = 4n + 2$

10. Write an equation that defines $m(x)$ as a trinomial where $m(x) = (3x - 1)(3 - x) + 4x^2 + 19$.

Solve for x when $m(x) = 0$.

11. Given $2x + ax - 7 > -12$, determine the largest integer value of a when $x = -1$.

12. If $4x^2 - 100 = 0$, the roots of the equation are

A. -25 and 25 B. -25, only C. -5 and 5 D. -5, only

13. Isaiah collects data from two different companies, each with four employees. The results of the study, based on each worker's age and salary, are listed in the tables below.

Company 1

Worker's Age in Years	Salary in Dollars
25	30,000
27	32,000
28	35,000
33	38,000

Company 2

Worker's Age in Years	Salary in Dollars
25	29,000
28	35,500
29	37,000
31	65,000

Which statement is true about these data?

A. The median salaries in both companies are greater than \$37,000.

B. The mean salary in company 1 is greater than the mean salary in company 2.

C. The salary range in company 2 is greater than the salary range in company 1.

D. The mean age of workers at company 1 is greater than the mean age of workers at company 2.

14. A company produces x units of a product per month, where $C(x)$ represents the total cost and $R(x)$ represents the total revenue for the month. The functions are modeled by $C(x) = 300x + 250$ and $R(x) = -0.5x^2 + 800x - 100$. The profit is the difference between revenue and cost where $P(x) = R(x) - C(x)$. What is the total profit, $P(x)$, for the month?

A. $P(x) = -0.5x^2 + 500x - 150$

B. $P(x) = -0.5x^2 + 500x - 350$

C. $P(x) = -0.5x^2 - 500x + 350$

D. $P(x) = -0.5x^2 + 500x + 350$

15. The value of the x-intercept for the graph of $4x - 5y = 40$ is

A. 10

B. $\frac{4}{5}$

C. $-\frac{4}{5}$

D. -8

16. Let f be a function such that $f(x) = 2x - 4$ is defined on the domain $2 \leq x \leq 6$. The range of this function is

A. $0 \leq y \leq 8$

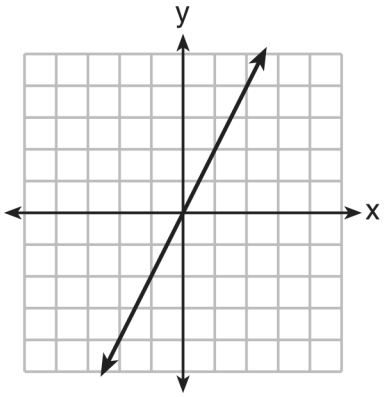
B. $0 \leq y < \infty$

C. $2 \leq y \leq 6$

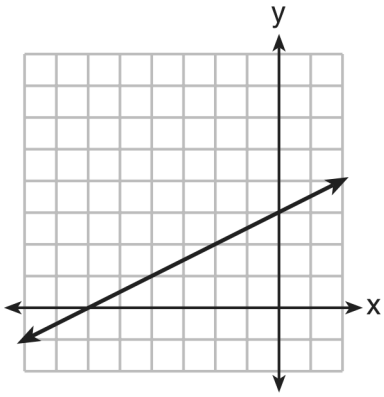
D. $-\infty < y < \infty$

17. Which graph shows a line where each value of y is three more than half of x?

A.



B.



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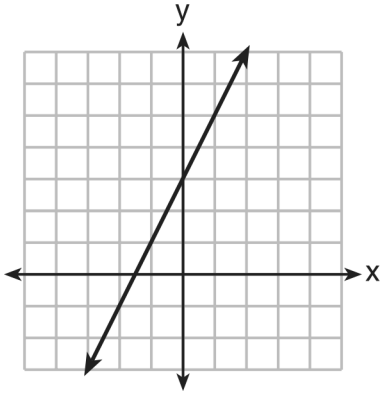
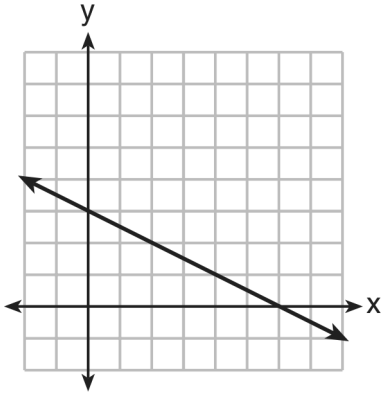


D.



18. The table below shows the average diameter of a pupil in a person's eye as he or she grows older.

age (years)	**Average Pupil Diameter** (mm)
20	4.7
30	4.3
40	3.9
50	3.5
60	3.1
70	2.7
80	2.3

What is the average rate of change, in millimeters per year, of a person's pupil diameter from age 20 to age 80?

A. 2.4 B. 0.04 C. −2.4 D. −0.04

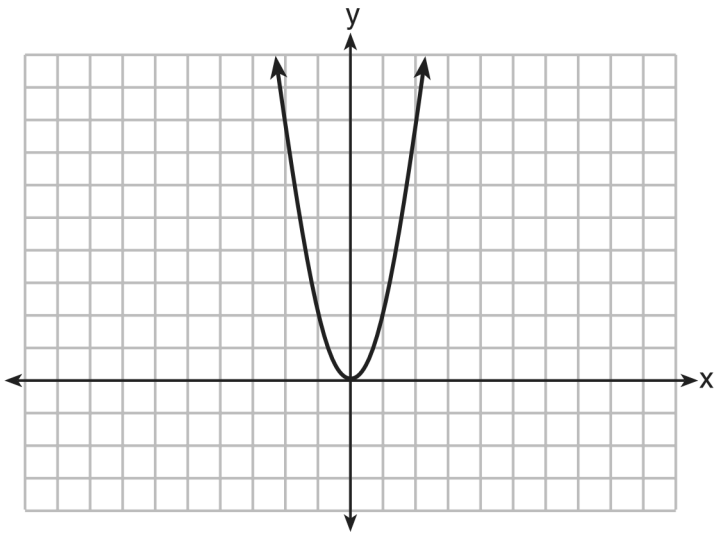
19. The third term in an arithmetic sequence is 10 and the fifth term is 26. If the first term is a_1, which is an equation for the nth term of this sequence?

A. $a_n = 8n + 10$ B. $a_n = 8n - 14$ C. $a_n = 16n + 10$ D. $a_n = 16n - 38$

20. What is the value of x in the equation $\frac{x-2}{3} + \frac{1}{6} = \frac{5}{6}$?

A. 4 B. 6 C. 8 D. 11

21. The graph of the equation $y = ax^2$ is shown below.



If a is multiplied by $-\frac{1}{2}$, the graph of the new equation is

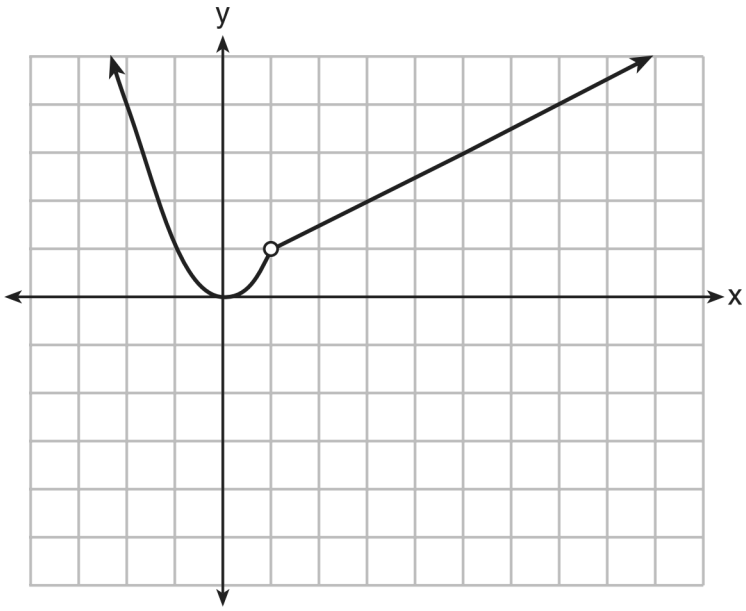
A. wider and opens downward B. wider and opens upward

C. narrower and opens downward D. narrower and opens upward

22. The zeros of the function $f(x) = (x + 2)^2 - 25$ are

A. -2 and 5 B. -3 and 7 C. -5 and 2 D. -7 and 3

23. A function is graphed on the set of axes below.



Which function is related to the graph?

A. $f(x) = \begin{cases} x^2, & x < 1 \\ x - 2, & x > 1 \end{cases}$

B. $f(x) = \begin{cases} x^2, & x < 1 \\ \frac{1}{2}x + \frac{1}{2}, & x > 1 \end{cases}$

C. $f(x) = \begin{cases} x^2, & x < 1 \\ 2x - 7, & x > 1 \end{cases}$

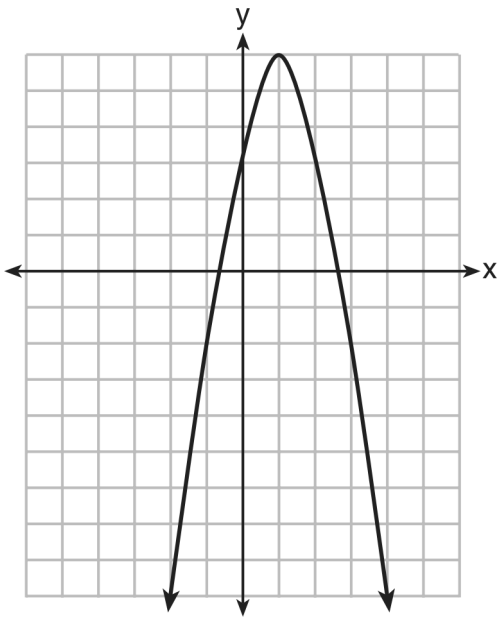
D. $f(x) = \begin{cases} x^2, & x < 1 \\ \frac{3}{2}x - \frac{9}{2}, & x > 1 \end{cases}$

24. If $f(1) = 3$ and $f(n) = -2f(n - 1) + 1$, then $f(5) =$

A. -5 B. 11 C. 21 D. 43

25. In the equation $x^2 + 10x + 24 = (x + a)(x + b)$, b is an integer. Find algebraically *all* possible values of b.

26. Let f be the function represented by the graph below.



Let g be a function such that $g(x) = -\frac{1}{2}x^2 + 4x + 3$

Determine which function has the larger maximum value. Justify your answer.

27. If the area of a rectangle is expressed as $x^4 - 9y^2$, then the product of the length and the width of the rectangle could be expressed as

A. $(x - 3y)(x + 3y)$ B. $(x^2 - 3y)(x^2 + 3y)$ C. $(x^2 - 3y)(x^2 - 3y)$ D. $(x^4 + y)(x - 9y)$

28. Which table represents a function?

A.

x	2	4	2	4
$f(x)$	3	5	7	9

B.

x	0	-1	0	1
$f(x)$	0	1	-1	0

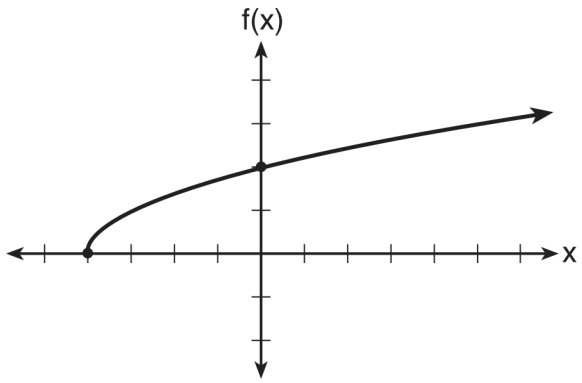
C.

x	3	5	7	9
$f(x)$	2	4	2	4

D.

x	0	1	-1	0
$f(x)$	0	-1	0	1

29. The graph of the function $f(x) = \sqrt{x+4}$ is shown below.



The domain of the function is

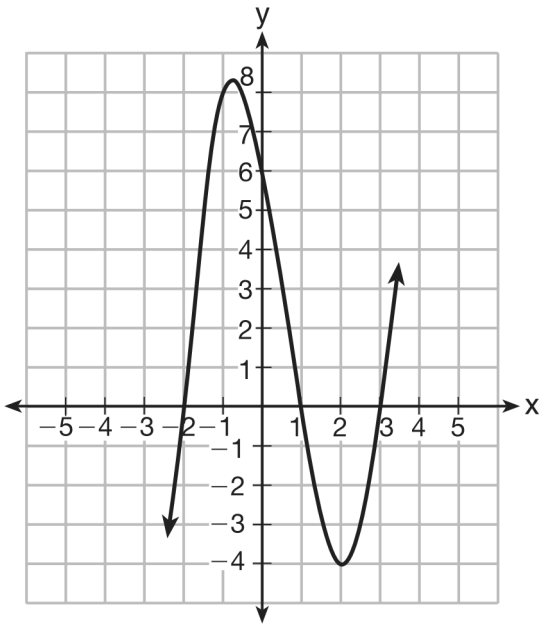
A. $\{x \mid x > 0\}$ B. $\{x \mid x \geq 0\}$ C. $\{x \mid x > -4\}$ D. $\{x \mid x \geq -4\}$

30. What are the zeros of the function $f(x) = x^2 - 13x - 30$?

A. -10 and 3 B. 10 and -3 C. -15 and 2 D. 15 and -2

31. Which equation(s) represent the graph below?

I $y = (x + 2)(x^2 - 4x - 12)$
II $y = (x - 3)(x^2 + x - 2)$
III $y = (x - 1)(x^2 - 5x - 6)$



A. I, only B. II, only C. I and II D. II and III

32. Which quadratic function has the largest maximum?

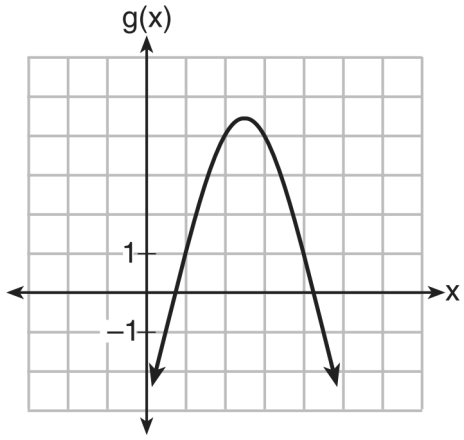
A. $h(x) = (3 - x)(2 + x)$

B.

x	$f(x)$
-1	-3
0	5
1	9
2	9
3	5
4	-3

C. $k(x) = -5x^2 - 12x + 4$

D.



33. If $f(x) = 3^x$ and $g(x) = 2x + 5$, at which value of x is $f(x) < g(x)$?

A. -1 B. 2 C. -3 D. 4

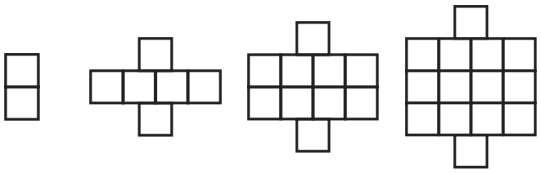
34. When directed to solve a quadratic equation by completing the square, Sam arrived at the equation $\left(x - \frac{5}{2}\right)^2 = \frac{13}{4}$. Which equation could have been the original equation given to Sam?

A. $x^2 + 5x + 7 = 0$ B. $x^2 + 5x + 3 = 0$ C. $x^2 - 5x + 7 = 0$ D. $x^2 - 5x + 3 = 0$

35. The distance a free falling object has traveled can be modeled by the equation $d = \frac{1}{2}at^2$, where a is acceleration due to gravity and t is the amount of time the object has fallen. What is t in terms of a and d?

A. $t = \sqrt{\frac{da}{2}}$ B. $t = \sqrt{\frac{2d}{a}}$ C. $t = \left(\frac{da}{d}\right)^2$ D. $t = \left(\frac{2d}{a}\right)^2$

36. A pattern of blocks is shown below.



Term 1 Term 2 Term 3 Term 4

If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the nth term?

I	II	III
$a_n = n + 4$	$a_1 = 2$ $a_n = a_{n-1} + 4$	$a_n = 4n - 2$

A. I and II B. I and III C. II and III D. III, only

37. What are the solutions to the equation $x^2 - 8x = 24$?

A. $x = 4 \pm 2\sqrt{10}$ B. $x = -4 \pm 2\sqrt{10}$ C. $x = 4 \pm 2\sqrt{2}$ D. $x = -4 \pm 2\sqrt{2}$

38. If the difference $(3x^2 - 2x + 5) - (x^2 + 3x - 2)$ is multiplied by $\frac{1}{2}x^2$, what is the result, written in standard form?

39. Dylan invested \$600 in a savings account at a 1.6% annual interest rate. He made no deposits or withdrawals on the account for 2 years. The interest was compounded annually. Find, to the *nearest cent*, the balance in the account after 2 years.

40. Albert says that the two systems of equations shown below have the same solutions.

First System	Second System
$8x + 9y = 48$	$8x + 9y = 48$
$12x + 5y = 21$	$-8.5y = -51$

Determine and state whether you agree with Albert. Justify your answer.

41. The equation to determine the weekly earnings of an employee at The Hamburger Shack is given by $w(x)$, where x is the number of hours worked.

$$w(x) = \begin{cases} 10x, & 0 \le x \le 40 \\ 15(x - 40) + 400, & x > 40 \end{cases}$$

Determine the difference in salary, *in dollars*, for an employee who works 52 hours versus one who works 38 hours.

Determine the number of hours an employee must work in order to earn \$445. Explain how you arrived at this answer.

42. Four expressions are shown below.

I. $2(2x^2 - 2x - 60)$
II. $4(x^2 - x - 30)$
III. $4(x + 6)(x - 5)$
IV. $4x(x - 1) - 120$

The expression $4x^2 - 4x - 120$ is equivalent to

A. I and II, only
B. II and IV, only
C. I, II, and IV
D. II, III, and IV

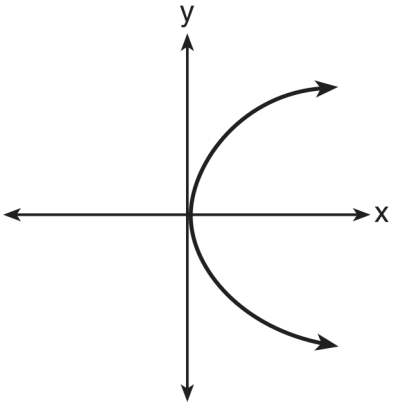
43. Which representations are functions?

I

x	y
2	6
3	−12
4	7
5	5
2	−6

II $\{(1, 1),\ (2, 1),\ (3, 2),\ (4, 3),\ (5, 5),\ (6, 8),\ (7, 13)\}$

III



IV $y = 2x + 1$

A. I and II
B. II and IV
C. III, only
D. IV, only

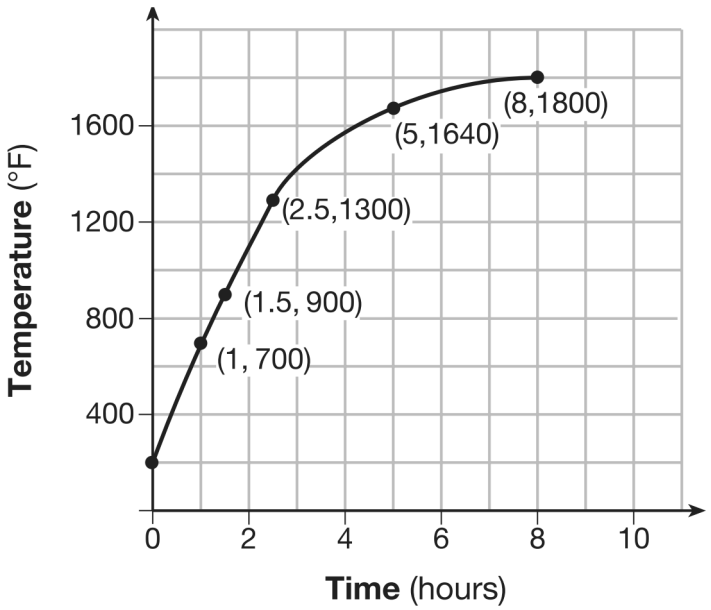
44. If $f(x) = \dfrac{\sqrt{2x + 3}}{6x - 5}$, then $f(\frac{1}{2}) =$

A. 1
B. −2
C. −1
D. $-\dfrac{13}{3}$

45. Which recursively defined function has a first term equal to 10 and a common difference of 4?

A. $f(1) = 10$, $f(x) = f(x - 1) + 4$
B. $f(1) = 4$, $f(x) = f(x - 1) + 10$
C. $f(1) = 10$, $f(x) = 4f(x - 1)$
D. $f(1) = 4$, $f(x) = 10f(x - 1)$

46. Firing a piece of pottery in a kiln takes place at different temperatures for different amounts of time. The graph below shows the temperatures in a kiln while firing a piece of pottery after the kiln is preheated to 200° F.

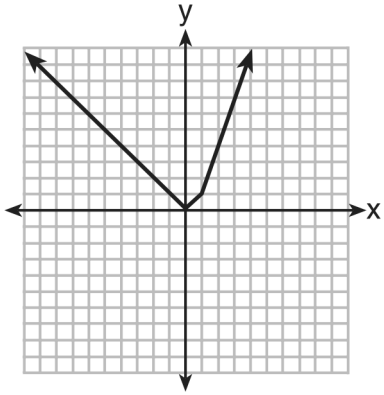


During which time interval did the temperature in the kiln show the greatest average rate of change?

A. 0 to 1 hour B. 1 hour to 1.5 hours C. 2.5 hours to 5 hours D. 5 hours to 8 hours

47. Which graph represents $f(x) = \begin{cases} |x| & x < 1 \\ \sqrt{x} & x \geq 1 \end{cases}$?

A.



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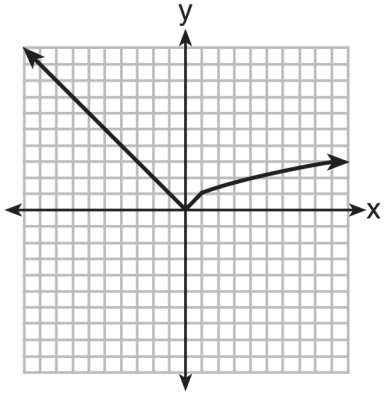

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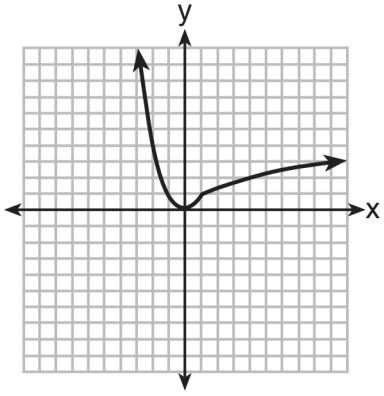
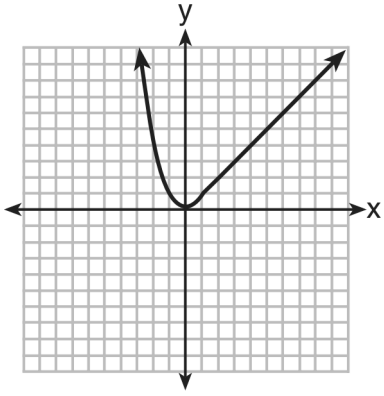


D.



48. If $f(x) = x^2 - 2x - 8$ and $g(x) = \frac{1}{4}x - 1$, for which values of x is $f(x) = g(x)$?

A. -1.75 and -1.438 B. -1.75 and 4 C. -1.438 and 0 D. 4 and 0

49. Given the following quadratic functions:

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

and

x	-3	-2	-1	0	1	2	3	4	5
$n(x)$	-7	0	5	8	9	8	5	0	-7

Which statement about these functions is true?

A. Over the interval $-1 \leq x \leq 1$, the average rate of change for $n(x)$ is less than that for $g(x)$.

B. The y-intercept of $g(x)$ is greater than the y-intercept for $n(x)$.

C. The function $g(x)$ has a greater maximum value than $n(x)$.

D. The sum of the roots of $n(x) = 0$ is greater than the sum of the roots of $g(x) = 0$.

50. Which trinomial is equivalent to $3(x - 2)^2 - 2(x - 1)$?

A. $3x^2 - 2x - 10$ B. $3x^2 - 2x - 14$ C. $3x^2 - 14x + 10$ D. $3x^2 - 14x + 14$

51. How many real solutions does the equation $x^2 - 2x + 5 = 0$ have? Justify your answer.

52. A toy rocket is launched from the ground straight upward. The height of the rocket above the ground, in feet, is given by the equation $h(t) = -16t^2 + 64t$, where t is the time in seconds. Determine the domain for this function in the given context. Explain your reasoning.

53. Solve for x algebraically: $7x - 3(4x - 8) < 6x + 12 - 9x$

If x is a number in the interval $[4, 8]$, state all integers that satisfy the given inequality. Explain how you determined these values.

54. When the expressions $x^2 - 9$ and $x^2 - 5x + 6$ are factored, a common factor is

A. $x + 3$ B. $x - 3$ C. $x - 2$ D. x^2

55. The expression $3x^2 - 7x + 2$ is equivalent to

A. $(3x + 2)(x + 1)$ B. $(3x + 1)(x + 2)$ C. $(3x - 2)(x - 1)$ D. $(3x - 1)(x - 2)$

56. Factor completely: $x^3 + 5x^2 + 6x$

57. If $12x^4 - 3x^3 + 6x^2$ is divided by $3x^2$, the quotient is

A. $9x^2 - 3$ B. $5x^2$ C. $4x^2 - 3x + 2$ D. $4x^2 - x + 2$

58. What is the value of $\frac{3}{4}\left(\frac{2}{3}\right)^0$?

A. 1 B. $\frac{4}{3}$ C. $\frac{3}{4}$ D. $\frac{6}{12}$

59. The expression $3^2 \cdot 3^3 \cdot 3^4$ is equivalent to

A. 27^9 B. 27^{24} C. 3^9 D. 3^{24}

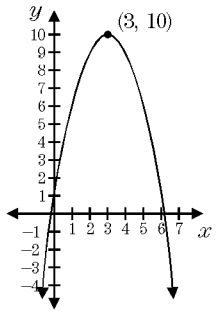
60. The expression $\dfrac{\left(10w^3\right)^2}{5w}$ is equivalent to

A. $2w^5$ B. $2w^8$ C. $20w^5$ D. $20w^8$

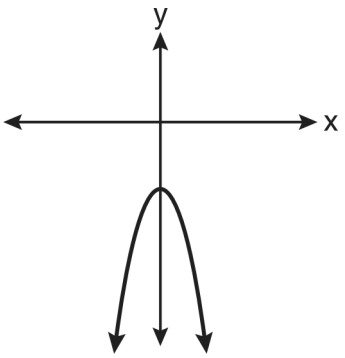
61. Which equation defines the graph in the diagram?

A. $y = x^2 + 6x + 1$ B. $y = -x^2 + 6x + 1$

C. $y = x^2 + 3x$ D. $y = -x^2 + 3x - 1$

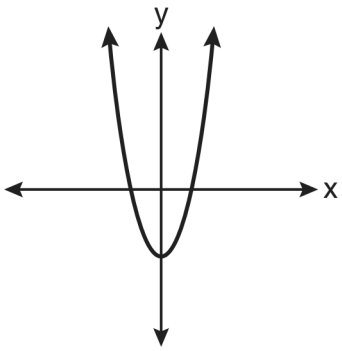


62. The diagram below shows the graph of $y = -x^2 - c$.

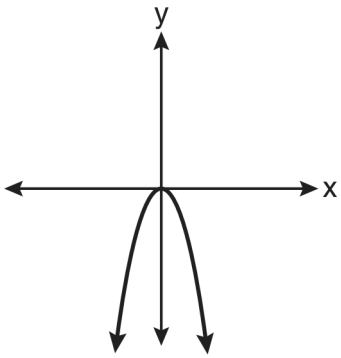


Which diagram shows the graph of $y = x^2 - c$?

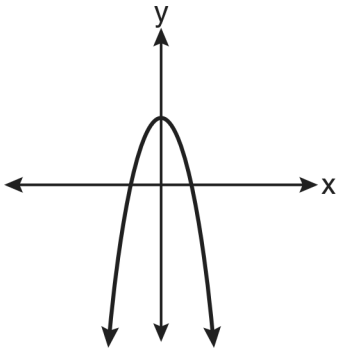
A.



B.



C.



D.