

## **Instructional Materials for WCSD Math Common Finals**

The Instructional Materials are for student and teacher use and are aligned to the 2021-2022 Course Guides for the following courses:

### **High School Algebra 1 S2**

- #2202 Algebra 1 S2
- #7770 Foundations in Algebra 1 S2

### **Middle School Algebra 1 S2**

- #228 Algebra 1 (Semester 2)
- #217B VMS ALG 1 S2
- #776 ACCEL Algebra 1

When used as test practice, success on the Instructional Materials does not guarantee success on the district math common final or the Nevada End of Course Exam.

Students can use these Instructional Materials to become familiar with the format and language used on the district common finals. Familiarity with standards and vocabulary as well as interaction with the types of problems included in the Instructional Materials can result in less anxiety on the part of the students. The length of the actual final exam may differ in length from the Instructional Materials.

Teachers can use the Instructional Materials in conjunction with the course guides to ensure that instruction and content is aligned with what will be assessed. The Instructional Materials are not representative of the depth or full range of learning that should occur in the classroom.

# Algebra 1 Reference Sheet

Note: You may use these formulas throughout this entire test.

## Linear

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

Midpoint  $M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Distance  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Slope-Intercept Form  $y = mx + b$

## Quadratic

Vertex-Form  $y = a(x - h)^2 + k$

Standard Form  $y = ax^2 + bx + c$

Intercept Form  $y = a(x - p)(x - q)$

## Exponential

(h, k) Form  $y = ab^{x-h} + k$

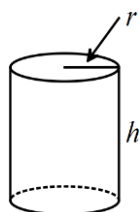
## Probability

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

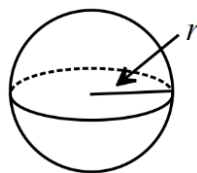
$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

## Volume and Surface Area



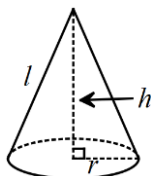
$$V = \pi r^2 h$$

$$SA = 2(\pi r^2) + h(2\pi r)$$



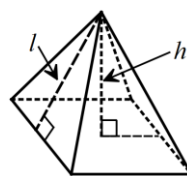
$$V = \frac{4}{3} \pi r^3$$

$$SA = 4\pi r^2$$



$$V = \frac{1}{3} \pi r^2 h$$

$$SA = \pi r^2 + \frac{1}{2}(2\pi r \cdot l)$$

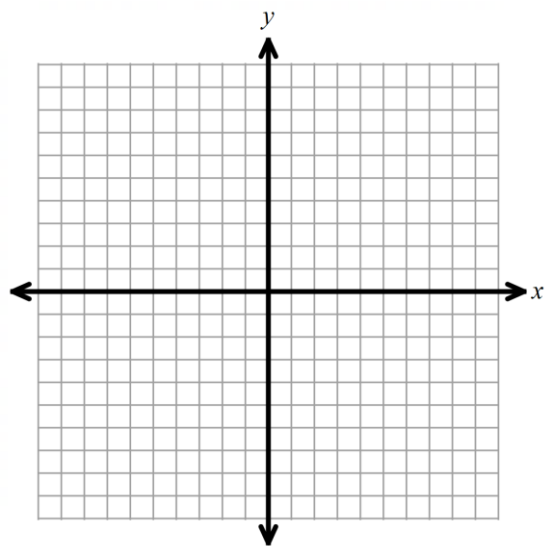
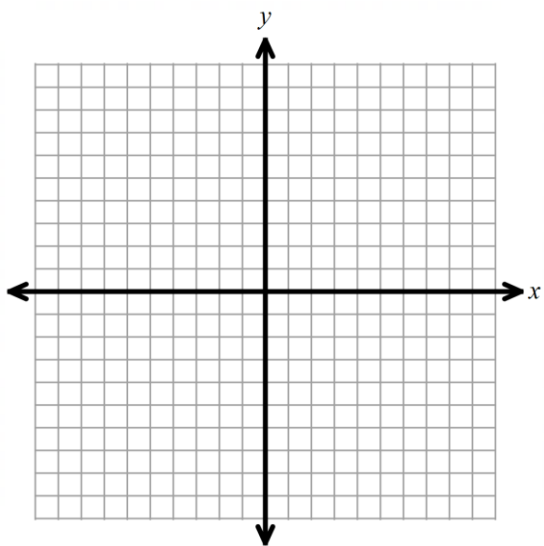
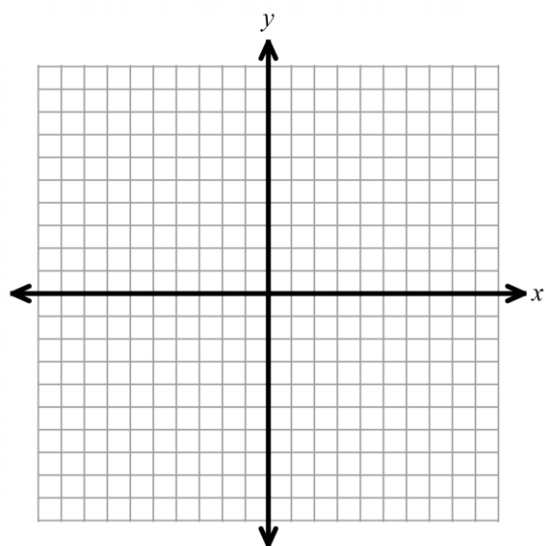
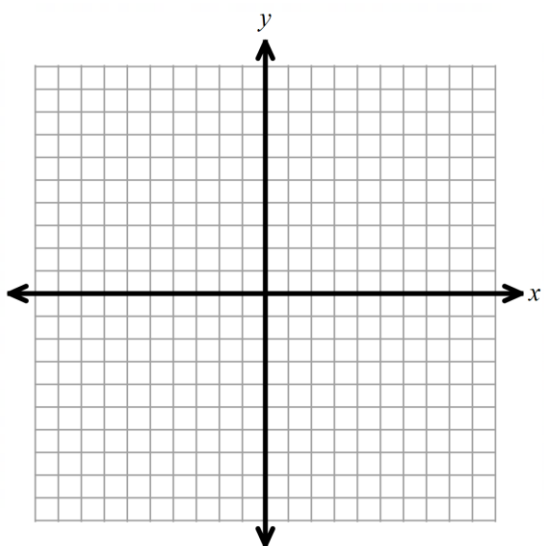
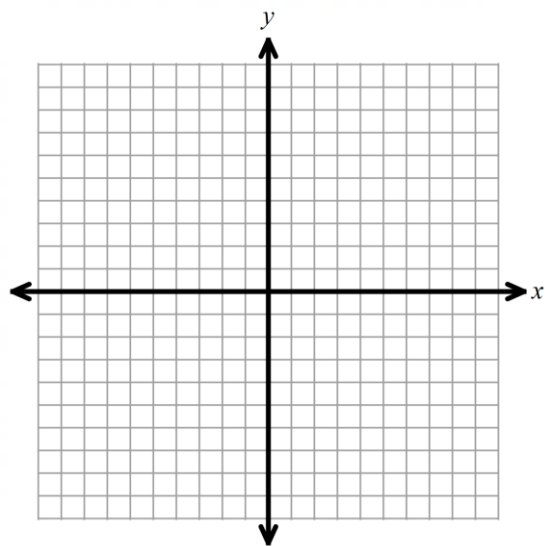
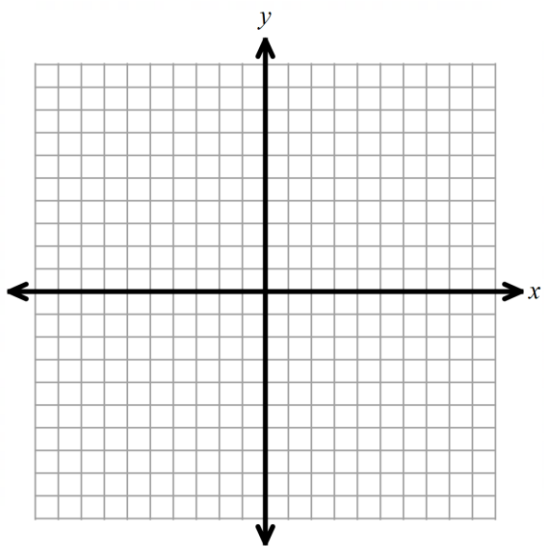


$$V = \frac{1}{3} Bh$$

$$SA = B + \frac{1}{2}(Pl)$$

Where  $B$  = base area  
and  $P$  = base perimeter

# Student Work Area



1. Which expression is equivalent to  $\sqrt{x^3}$  ?

A.  $x^3$

C.  $x^{\frac{1}{3}}$

B.  $x^{\frac{2}{3}}$

D.  $x^{\frac{3}{2}}$

2. What is the solution for  $x$  in  $5^{2x-9} = \frac{1}{125}$  ?

A.  $x = -8$

C.  $x = 6$

B.  $x = 3$

D.  $x = 17$

3. Solve for  $x$ :  $256^{x-1} = 64^{2x-6}$

A.  $x = -1$

C.  $x = 7$

B.  $x = 5$

D.  $x = 9$

4. Determine which functions below are exponential. **Select all that apply.**

**F.**

$x$	0	1	2	3	4
$y$	0	10	50	60	100

**G.**

$x$	0	1	2	3	4
$y$	21	18	15	12	9

**H.**

$x$	0	1	2	3	4
$y$	3	3.5	4	4.5	5

**I.**

$x$	0	1	2	3	4
$y$	7	$\frac{7}{3}$	$\frac{7}{9}$	$\frac{7}{27}$	$\frac{7}{81}$

**J.**

$x$	0	1	2	3	4
$y$	10	20	40	80	160

5. What is the domain and range of  $h(x) = \left(\frac{1}{4}\right)^x$  ?

**A.** domain:  $x \geq 0$   
range: all real numbers

**C.** domain: all real numbers  
range:  $y \geq 0$

**B.** domain:  $x > 0$   
range: all real numbers

**D.** domain: all real numbers  
range:  $y > 0$

6. If  $f(x) = 3 \cdot 4^x$  and  $g(x) = 3 \cdot 2^x$ , compare the functions and determine which of the following statements is correct.

**A.** The  $x$ -intercept of  $f(x)$  is greater than the  $x$ -intercept of  $g(x)$ .

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

**C.** The functions increase at the same rate.

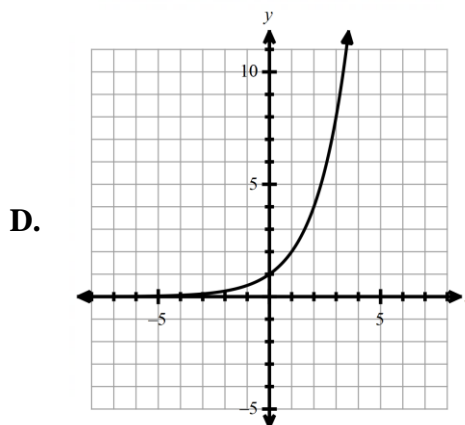
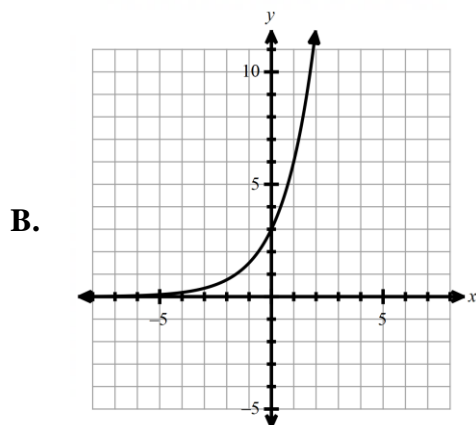
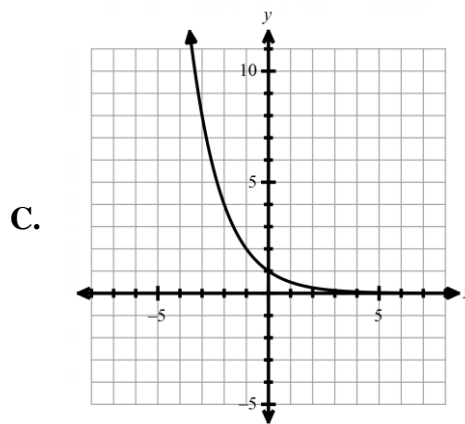
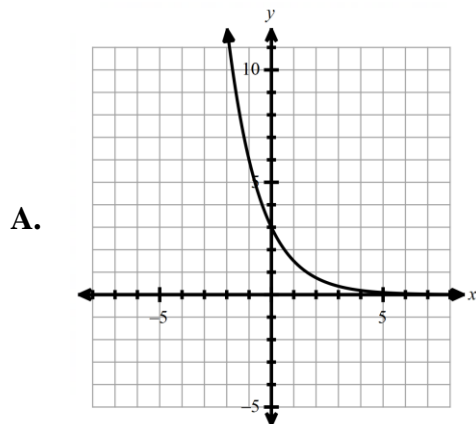
**D.** The functions have the same  $y$ -intercept.

# ALGEBRA 1 SEMESTER 2 INSTRUCTIONAL MATERIALS

HS Courses: #2202 Algebra 1 S2 and #7770 Foundations in Algebra 1 S2  
 MS Courses: #218 Algebra 1, #217B VMS ALG 1 S2, and #776 ACCEL Algebra 1

2021-2022

7. Which of the following represents the graph of  $f(x) = 3 \cdot \left(\frac{1}{2}\right)^x$ ?



8. Which function is represented by the table of values below?

$x$	0	1	2	3	4
$y$	16	4	1	$\frac{1}{4}$	$\frac{1}{16}$

A.  $f(x) = \frac{1}{16} \cdot (4)^x$

C.  $f(x) = 16 \cdot \left(\frac{1}{4}\right)^x$

B.  $f(x) = \frac{1}{4} \cdot (16)^x$

D.  $f(x) = 4 \cdot \left(\frac{1}{16}\right)^x$

9. Identify which functions represent exponential decay.  
**Select all that apply.**

F.  $f(x) = 100(1 - 0.9)^x$

G.  $f(x) = 0.4(9)^x$

H.  $f(x) = \left(\frac{3}{2}\right)^x$

I.  $f(x) = 250(1 + 0.25)^x$

J.  $f(x) = \left(\frac{2}{5}\right)^x$

K.  $f(x) = 8(0.75)^x$

10. A local shipping company offers starting employees a salary of \$30,000 per year. Employees receive a 3% pay increase each year they are with the company. What function represents the amount of an employee's salary after  $t$  years?

A.  $f(t) = 30,000(1.03)^t$

C.  $f(t) = 30,000(0.03)^t$

B.  $f(t) = 30,000(t + 0.03)$

D.  $f(t) = 30,000(1.03t)$

11. What is the average rate of change of  $f(x) = 7 \cdot (3)^x$  over the interval  $2 \leq x \leq 5$ ?

A. 546

C. 63

B. 189

D. 21

12. Write a recursive formula for the sequence below, assuming  $f(1)$  is the first term in the sequence:

$$3, -6, 12, -24, 48 \dots$$

- A.  $f(1) = -6$  and  $f(n) = f(n - 1) \cdot (-2)$ , for  $n \geq 2$
- B.  $f(1) = -2$  and  $f(n) = f(n - 1) \cdot 3$ , for  $n \geq 2$
- C.  $f(1) = 3$  and  $f(n) = f(n - 1) \cdot (-2)$ , for  $n \geq 2$
- D.  $f(1) = 3$  and  $f(n) = f(n - 1) - 9$ , for  $n \geq 2$
13. Write an explicit formula for the geometric sequence given  $a_3 = 1$  and  $a_5 = 0.25$ . Assume the common ratio is positive.

A.  $a_n = 8(0.25)^{n-1}$

C.  $a_n = 0.5(4)^{n-1}$

B.  $a_n = 4(0.5)^{n-1}$

D.  $a_n = 0.25(8)^{n-1}$

14. Simplify:  $(6x + 14x^3 - 7x^2 - 1) + (-3x^2 + 5 - 9x^3)$

A.  $19x^3 - 16x^2 + 3x - 1$

C.  $5x^3 - 10x^2 + 6x + 4$

B.  $15x^3 + 2x^2 + 9x - 1$

D.  $23x^3 - 4x^2 + 6x + 4$





# ALGEBRA 1 SEMESTER 2 INSTRUCTIONAL MATERIALS

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2021-2022

19. Which of the following is the product of  $(7x - 9)(7x + 9)$  ?
- A.  $49x^2 + 81$                                       C.  $49x^2 + 126x + 81$   
B.  $49x^2 - 81$                                       D.  $49x^2 - 126x - 81$
20. Which of the following is the fully factored form of  $27x^4 - 36x^2 + 45x$  ?
- A.  $9x(3x^3 - 4x + 5)$                               C.  $3x(9x^3 - 12x + 15)$   
B.  $9x^4(3x^3 - 4x + 5)$                               D.  $3x^3(9x^3 - 12x + 15)$
21. The polynomial  $x^2 + 11x + 30$  is factorable. One factor is  $(x + 6)$ , what is the other factor?
- A.  $(x + 1)$     C.  $(x - 5)$   
B.  $(x + 3)$     D.  $(x + 5)$
22. What is the factored form of  $12x^2 - 5x - 2$  ?
- A.  $(3x + 2)(4x - 1)$                               C.  $(3x + 1)(4x - 2)$   
B.  $(3x - 2)(4x + 1)$                               D.  $(3x - 1)(4x + 2)$

23. Determine which expressions are equivalent to  $-x^2 + 3x + 10$ .  
Select all that apply.

F.  $-(x + 2)(x - 5)$

G.  $(x + 2)(5 - x)$

H.  $(x + 5)(x - 2)$

I.  $(-x - 2)(x - 5)$

J.  $(-x + 2)(-x - 5)$

24. Which of the following is a factor of  $3x^2 - 12$  ?

A.  $(x + 12)$

C.  $(x - 2)$

B.  $(x - 4)$

D.  $(x + 4)$

25. If  $f(x) = \frac{1}{2}x^2 + 6$ , what is the value of  $f(8)$ ?

A.  $f(8) = 14$

C.  $f(8) = \pm 2$

B.  $f(8) = 38$

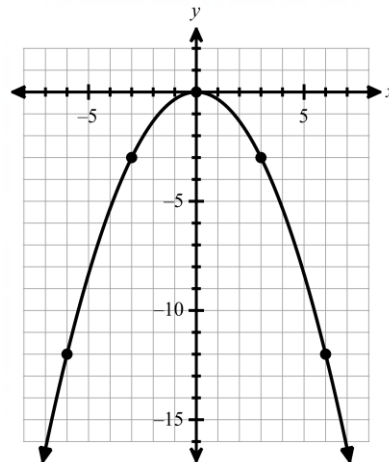
D.  $f(8) = 4x^2 + 48$

26. The function  $f(x) = x^2$  is transformed into the function  $g(x) = -\frac{3}{2}x^2$ . Determine which statements below are true. **Select all that apply.**

- F. The graph of  $g(x)$  opens upward.
- G. The graph of  $g(x)$  is wider than the graph of  $f(x)$ .
- H. The axis of symmetry of  $g(x)$  is left of the axis of symmetry of  $f(x)$ .
- I. The graph of  $g(x)$  opens downward.
- J. The axis of symmetry of  $g(x)$  and  $f(x)$  are the same.
- K. The graph of  $g(x)$  is narrower than the graph of  $f(x)$ .

27. The function  $f(x)$  is graphed below. What is the average rate of change of  $f(x)$  over the interval  $0 \leq x \leq 6$ ?

- A.  $\frac{1}{2}$
- B. 2
- C.  $-\frac{1}{2}$
- D. -2

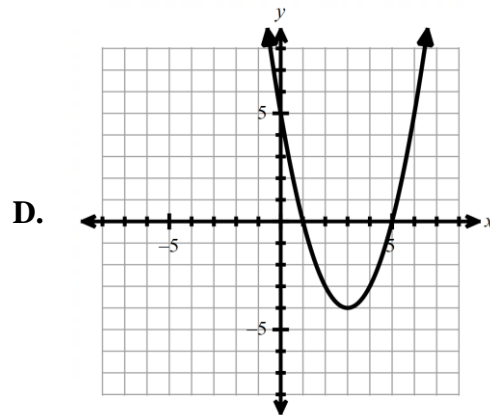
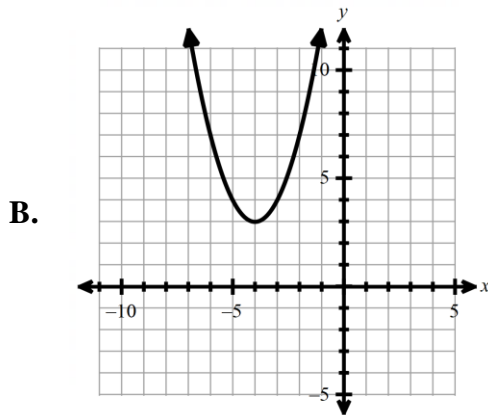
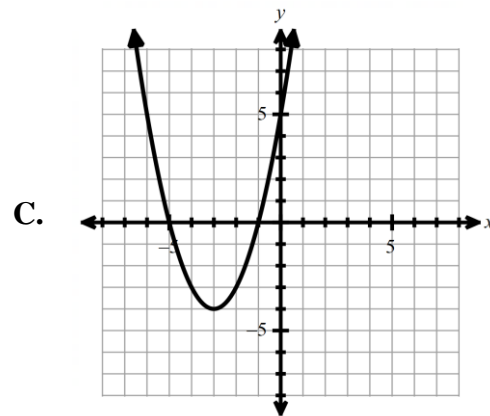
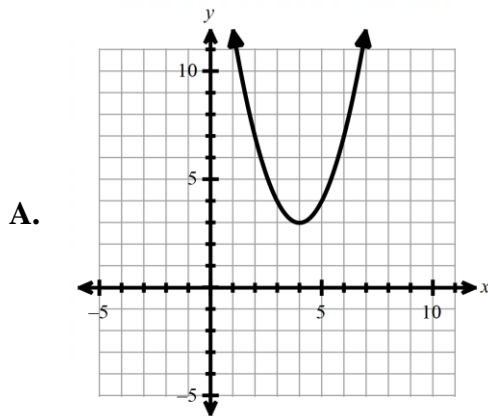


# ALGEBRA 1 SEMESTER 2 INSTRUCTIONAL MATERIALS

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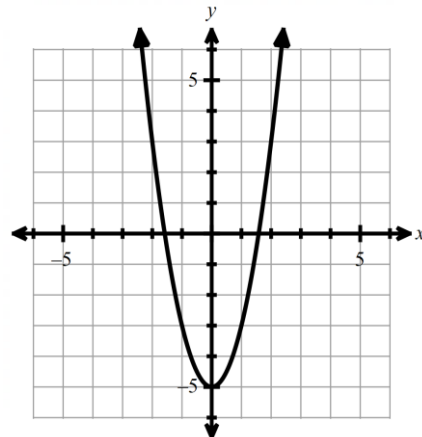
2021-2022

28. Which of the following graphs represents  $f(x) = (x - 4)^2 + 3$  ?



29. Which of the following quadratic functions represents the function graphed below?

- A.  $y = \frac{1}{2}x^2 - 5$
- B.  $y = 2x^2 - 5$
- C.  $y = \frac{1}{2}(x + 5)^2$
- D.  $y = 2(x - 5)^2$



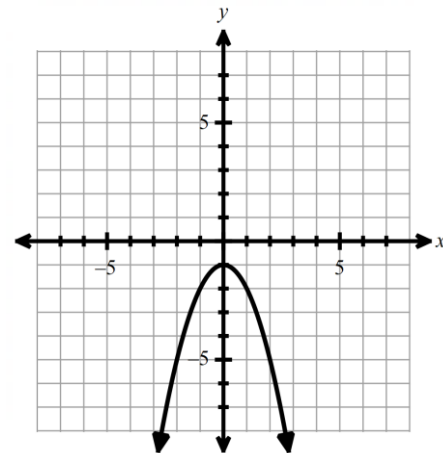
30. Describe how the graph of the function  $f(x) = x^2$  changes after the transformation  $f(x + 7)$  is applied.
- A. The graph is translated 7 units up.                      C. The graph is translated 7 units left.  
B. The graph is translated 7 units down.                      D. The graph is translated 7 units right.
31. Which of the following properly describes the graph of the function  $f(x) = \frac{1}{2}(x - 6)^2 - 10$  ?
- A. The graph of the function is compressed vertically by a factor of  $\frac{1}{2}$  and translated to the right 6 units and down 10 units from the parent function.  
B. The graph of the function is compressed vertically by a factor of  $\frac{1}{2}$  and translated to the left 6 units and down 10 units from the parent function.  
C. The graph of the function is stretched vertically by a factor of 2 and translated to the left 6 units and down 10 units from the parent function.  
D. The graph of the function is stretched vertically by a factor of 2 and translated to the right 6 units and down 10 units from the parent function.
32. Translate the graph of  $f(x) = x^2$  four units to the left, three units up and vertically stretch the graph by a factor of 5. Which of the following is the function after the transformations?
- A.  $f(x) = \frac{1}{5}(x + 4)^2 + 3$                       C.  $f(x) = 5(x + 4)^2 + 3$   
B.  $f(x) = \frac{1}{5}(x - 4)^2 + 3$                       D.  $f(x) = 5(x - 4)^2 + 3$

33. Which of the following is the vertex for  $f(x) = -4(x - 5)^2 + 2$  ?

- A. (25, 2)
- B. (-20, 2)
- C. (-5, 2)
- D. (5, 2)

34. Given the equation and graph of  $y = -x^2 - 1$ , what is the domain and range?

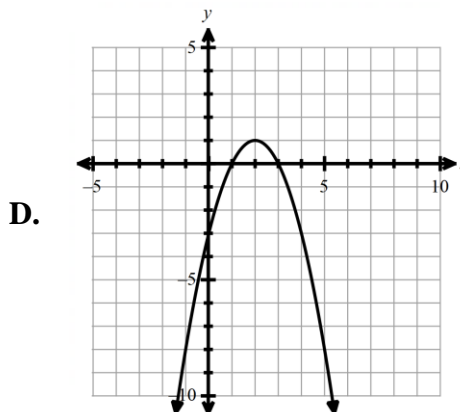
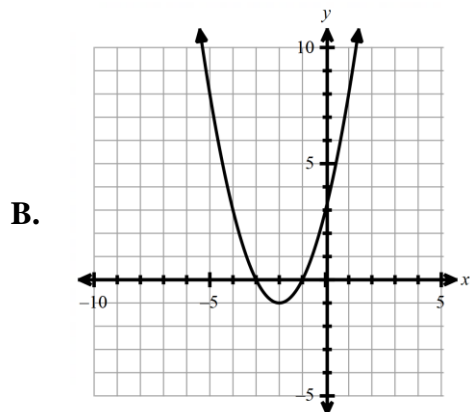
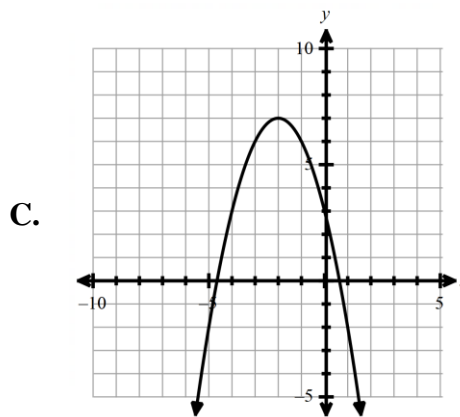
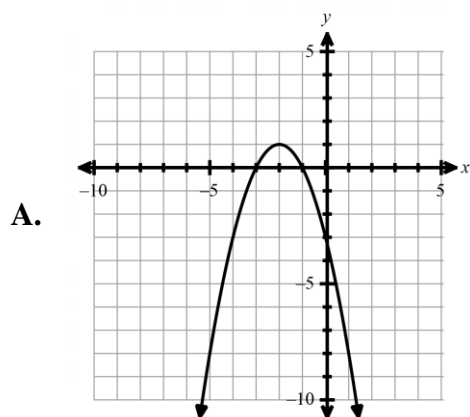
- A. Domain: *all real numbers*  
Range:  $y \geq 1$
- B. Domain: *all real numbers*  
Range:  $y \leq 1$
- C. Domain: *all real numbers*  
Range:  $y \leq -1$
- D. Domain:  $-1 \leq x \leq 1$   
Range:  $y \leq -1$



35. What is the vertex of the function  $f(x) = -2x^2 + 8x - 9$  ?

- A. (-4, -73)
- B. (4, -9)
- C. (-2, -33)
- D. (2, -1)

36. Which of the following is the graph of  $f(x) = -x^2 - 4x - 3$  ?



37. What is the axis of symmetry and the maximum value of the function  $f(x) = -2x^2 + 12x - 16$  ?

A. axis of symmetry:  $x = 6$   
 maximum value:  $-16$

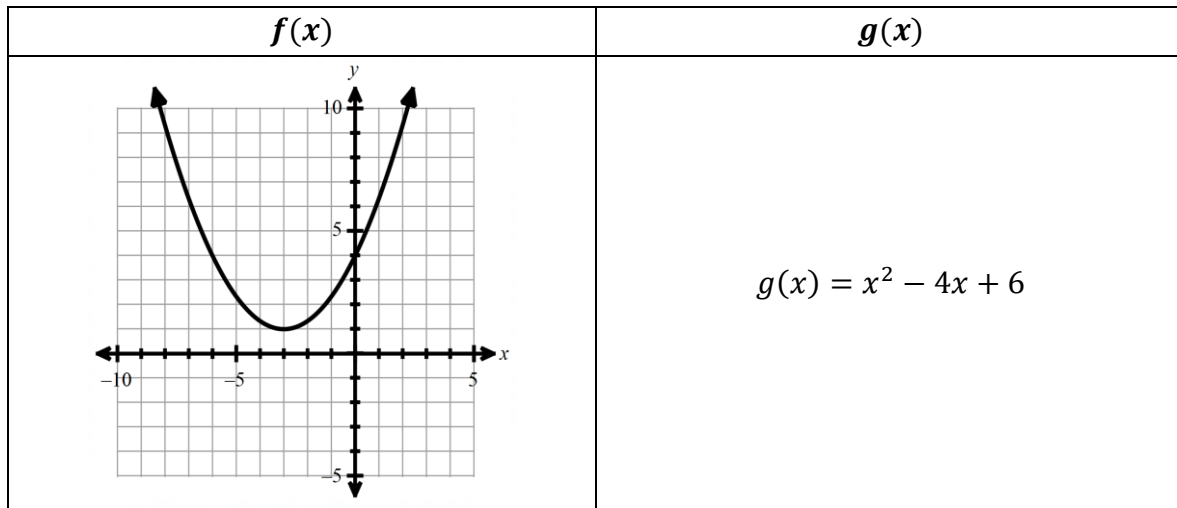
C. axis of symmetry:  $x = 2$   
 maximum value:  $3$

B. axis of symmetry:  $x = 3$   
 maximum value:  $2$

D. axis of symmetry:  $x = -16$   
 maximum value:  $6$



38. The functions  $f(x)$  and  $g(x)$  are represented below.



Which of the following statements about the y-intercepts of the functions is true?

- A.  $f(x)$  does not have a y-intercept.
- B. The y-intercept of  $f(x)$  is below the y-intercept of  $g(x)$ .
- C. The y-intercept of  $f(x)$  is above the y-intercept of  $g(x)$ .
- D.  $f(x)$  and  $g(x)$  have the same y-intercept.

39. If  $f(x) = g(x)$  and  $f(x) = 2(x - 5)^2 + 3$ , then which of the following functions can represent  $g(x)$ ?

- |                            |                             |
|----------------------------|-----------------------------|
| A. $g(x) = x^2 - 10x + 28$ | C. $g(x) = 2x^2 - 20x + 53$ |
| B. $g(x) = 2x^2 - 10x + 3$ | D. $g(x) = 2x^2 - 20x + 50$ |

40. A model rocket is launched from the top of a platform 6 feet above the ground with an initial velocity of 125 ft/s. The function  $h(t) = -16t^2 + 125t + 6$  represents the height ( $h$ ) of the rocket  $t$  seconds after it is launched. What is the maximum height of the rocket to the nearest foot?

- A. 104 feet
- B. 125 feet
- C. 180 feet
- D. 250 feet

41. Which of the following best describes the data in the table?

$x$	1	2	3	4
$y$	3	9	27	81

- A. Exponential with a growth factor of 3
- B. Linear with a rate of change of 6
- C. Quadratic with a second difference of 12
- D. None of the above

42. The table below represents the function  $y = 4x^2 + 8x - 12$ . Use the table to find the solutions of the equation  $4x^2 + 8x - 12 = 0$ . **Select all that apply.**

- F.  $x = -16$
- G.  $x = -12$
- H.  $x = -3$
- I.  $x = -1$
- J.  $x = 0$
- K.  $x = 1$

$x$	$y$
-4	20
-3	0
-2	-12
-1	-16
0	-12
1	0
2	20

43. Which of the following are the  $x$ -intercepts for  $y = (x + 2)^2 - 16$ ?

A.  $(-6, 0), (2, 0)$

C.  $(-6, 0), (-2, 0)$

B.  $(-2, 0), (16, 0)$

D.  $(2, 0), (-16, 0)$

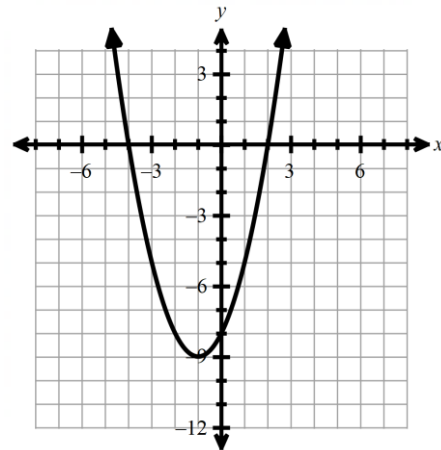
44. Which of the following functions is modeled by the graph below?

A.  $y = (x - 1)(x - 9)$

B.  $y = (x + 1)(x + 9)$

C.  $y = (x + 2)(x - 4)$

D.  $y = (x - 2)(x + 4)$



45. What are the zeros of the function  $f(x) = 2x^2 - 12x + 18$  ?

A.  $x = 2$  and  $x = 3$

C.  $x = 3$

B.  $x = -3$  and  $x = 3$

D.  $x = -3$

46. A quadratic function has zeros at 1 and  $-8$ . Which of the following could be the function?

A.  $f(x) = x^2 + 8x$

C.  $f(x) = x^2 + 7x - 8$

B.  $f(x) = x^2 - 8x$

D.  $f(x) = x^2 - 7x - 8$

47. Simplify the expression:  $\sqrt{8x^4} \cdot \sqrt{6x^3}$

A.  $16x^6\sqrt{x^3}$

C.  $12x^3\sqrt{x}$

B.  $4x^3\sqrt{3x}$

D.  $24x^6$

48. Solve for  $x$  in  $16x^2 - 49 = 0$ .

A.  $x = \pm \frac{49}{16}$

C.  $x = \pm \frac{16}{49}$

B.  $x = \pm \frac{7}{4}$

D.  $x = \pm \frac{4}{7}$

49. What value of  $c$  will make  $x^2 - 24x + c$  a perfect square trinomial?

A.  $c = 144$

C.  $c = 576$

B.  $c = -12$

D.  $c = -48$

50. Which of the following is the vertex form of  $f(x) = x^2 + 4x + 7$  ?

A.  $f(x) = (x + 2)^2 + 7$

C.  $f(x) = (x + 2)^2 + 3$

B.  $f(x) = (x - 2)^2 + 4$

D.  $f(x) = (x - 2)^2 + 3$

51. Solve for  $x$ :  $x^2 + 4x - 8 = 0$ .

A.  $x = -2 \pm 2\sqrt{3}$

C.  $x = -4 \pm 4\sqrt{3}$

B.  $x = -4 \pm 2\sqrt{3}$

D.  $x = -2 \pm 4\sqrt{3}$

52. Which of the following is a solution to  $2x^2 + 14x = 18$  ?

A.  $x = \frac{7 \pm \sqrt{85}}{2}$

C.  $x = \frac{-7 \pm \sqrt{85}}{2}$

B.  $x = \frac{-7 \pm \sqrt{13}}{2}$

D.  $x = \frac{14 \pm \sqrt{340}}{4}$

53. The height ( $h$ ), in feet, of a person jumping off a diving platform can be modeled by the equation  $h = -16t^2 + 4t + 6$  where  $t$  represents the time in seconds the person is in the air. After how many seconds does the person jumping off the platform enter the water?

A.  $-\frac{1}{2}$  second

C.  $\frac{4}{3}$  seconds

B.  $\frac{3}{4}$  second

D. 2 seconds

# ALGEBRA 1 SEMESTER 2 INSTRUCTIONAL MATERIALS

HS Courses: #2202 Algebra 1 S2 and #7770 Foundations in Algebra 1 S2  
MS Courses: #218 Algebra 1, #217B VMS ALG 1 S2, and #776 ACCEL Algebra 1

2021-2022

Algebra 1 Semester 2 Instructional Materials 2021-22 Answers											
Topic 6 Exponents and Exponential Functions			Topic 7 Polynomials and Factoring			Topic 8 Quadratic Functions			Topic 9 Solving Quadratic Equations		
#	Ans	Standard	#	Ans	Standard	#	Ans	Standard	#	Ans	Standard
1.	D	HSN.RN.A.2	14.	C	HSA.APR.A.1	25.	B	HSF.IF.A.2	42.	H, K	HSA.REI.D.11
2.	B	HSN.RN.A.1	15.	D	HSA.APR.A.1	26.	I, J, K	HSF.IF.B.4	43.	A	HSA.REI.B.4b
3.	C	HSN.RN.A.1	16.	B	HSA.APR.A.1	27.	D	HSF.IF.B.6	44.	D	HSA.SSE.B.3a
4.	I, J	HSF.LE.A.1	17.	D	HSA.APR.A.1	28.	A	HSF.IF.C.7a	45.	C	HSA.REI.B.4 HSA.SSE.B.3a
5.	D	HSF.IF.B.5	18.	A	HSA.APR.A.1	29.	B	HSF.IF.C.7a	46.	C	HSA.CED.A.2 HSF.IF.C.8
6.	D	HSF.IF.B.4 HSF.IF.C.9	19.	B	HSA.APR.A.1	30.	C	HSF.BF.B.3	47.	B	HSN.RN.A.2
7.	A	HSF.IF.B.4	20.	A	HSA.APR.A.1	31.	A	HSF.BF.B.3	48.	B	HSA.REI.B.4b
8.	C	HSF.BF.A.1	21.	D	HSA.SSE.A.1a	32.	C	HSF.BF.B.3	49.	A	HSA.SSE.B.3
9.	F, J, K	HSF.IF.C.8b	22.	B	HSA.SSE.A.1a	33.	D	HSF.BF.B.3	50.	C	HSF.IF.C.8a
10.	A	HSA.CED.A.2 HSF.LE.A.2	23.	F, G, I	HSA.SSE.A.1a	34.	C	HSF.IF.B.4	51.	A	HSA.REI.B.4b
11.	A	HSF.IF.B.6	24.	C	HSA.SSE.A.1 HSA.SSE.A.2	35.	D	HSF.IF.C.7a	52.	C	HSA.REI.B.4b
12.	C	HSF.BF.A.2				36.	A	HSF.IF.C.7a	53.	B	HSA.REI.B.4
13.	B	HSF.BF.A.2				37.	B	HSF.IF.B.4			
						38.	B	HSF.IF.C.9			
						39.	C	HSF.IF.C.8			
						40.	D	HSF.IF.B.4			
						41.	A	HSF.LE.A.3			