

Applied Algebra II Semester 1 Practice Exam A

1. To which sets of numbers does -5 belong?

I. integers

II. natural numbers

III. rational numbers

IV. real numbers

V. whole numbers

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

2. Evaluate $b^2 - 4ac$ for $a = -3$, $b = 1$, and $c = -2$.

- A. -23
B. -17
C. 17
D. 25

3. Which is a simplified form of the expression $12(x-1) - \frac{2}{3}(6x-18)$?

- A. $16x - 24$
B. $8x - 24$
C. $6x + 6$
D. $8x$

4. What is the value of n if $\frac{9}{7}n + \frac{2}{3} = \frac{5}{14}$?

- A. $n = -\frac{67}{42}$
B. $n = -\frac{39}{98}$
C. $n = -\frac{13}{54}$
D. $n = \frac{43}{54}$

5. Below is the formula for the surface area of a right circular cylinder.

$$A = 2\pi rh + 2\pi r^2$$

Which is a correct formula for the height, h , expressed in terms of radius, r , and surface area, A ?

- A. $h = \frac{2\pi r^2 - A}{2\pi r}$
B. $h = \frac{A}{2\pi r^2} - 2\pi r$
C. $h = A - 2\pi r - 2\pi r^2$
D. $h = \frac{A}{2\pi r} - r$

6. Which represents y in terms of x for the equation $3x + 2y = 5x - 6 + y$?

- A. $y = -2x + 6$
B. $y = 2x - 6$
C. $y = 8x - 6$
D. $y = 8x + 6$

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7. Rewrite the absolute value inequality as a compound inequality: $|x + 6| > 7$.

- A. $-13 < x < 1$
- B. $x > -13$ or $x < 1$
- C. $x < -13$ or $x > 1$
- D. no solution

8. Which expresses all of the solutions for the compound inequality below?

$$2(z + 4) \geq 2 \text{ and } 15 \geq -9 + 3z$$

- A. $-3 \leq z \leq 8$
- B. $z = -3$ and $z = 8$
- C. $z \leq -3$ and $z \geq 8$
- D. no solution

9. In 2000 the average price of a home in West County was \$95,000. By 2007 the average price of a home was \$123,000. Which of the following is a linear model for the price of a home, P , in West County in terms of the year, t ? Let $t = 0$ correspond to 2000.

- A. $P = 123,000 - 4,000t$
- B. $P = 95,000 + 4,000t$
- C. $P = 123,000 - 28,000t$
- D. $P = 28,000 + 95,000t$

10. Which relation is a function?

- A. $x = y^2 + 4$
- B. $3x^2 + 6y^2 - 5 = 1$
- C. $\{(-1, 6), (3, 6), (-5, 6)\}$
- D. $\{(6, -5), (6, 2), (2, -1)\}$

11. What is the range of the following relation?

$$\{(-2, 0), (1, -3), (5, -2)\}$$

- A. $\{-3, -2, 0\}$
- B. $\{-2, 1, 5\}$
- C. $\{0, 2, 3\}$
- D. $\{-5, -1, 2\}$

12. Write the standard form of the equation of the line that passes through the point $(-2, 2)$ and is parallel to the line $5x + 2y = -1$.

- A. $2x - 5y = 8$
- B. $2x - 5y = 12$
- C. $5x + 2y = -6$
- D. $5x + 2y = -1$

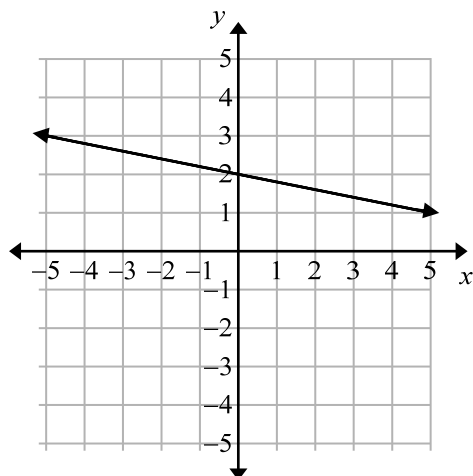
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13. Which equation describes the pattern in the table?

x	1	2	3	4	5
y	7	11	15	19	23

- A. $y = 3x - 4$
B. $y = 3x + 4$
C. $y = 4x - 3$
D. $y = 4x + 3$

14. Use the graph below.



What is the slope of the line?

- A. $\frac{5}{1}$
B. $\frac{1}{5}$
C. $-\frac{5}{1}$
D. $-\frac{1}{5}$

15. William is hiking in the hills. He began the hike at 10:00 a.m. at an elevation of 2,000 ft. He reached a peak of 4,000 ft. at 2:00 p.m. What is the average rate of change in Bill's elevation?

- A. 200 ft. per hour
B. 250 ft. per hour
C. 500 ft. per hour
D. 1000 ft. per hour

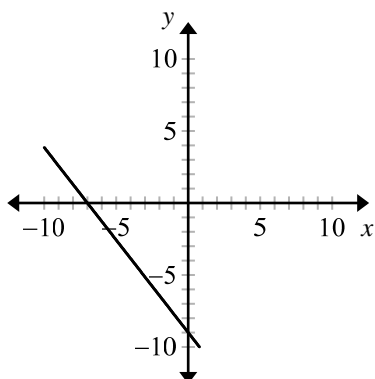
16. Write an equation in standard form that is perpendicular to $y = 5x - 2$ and goes through $(-10, 3)$.

- A. $x + 5y = 5$
B. $x - 5y = -25$
C. $5x - y = 2$
D. $5x + 5y = -42$

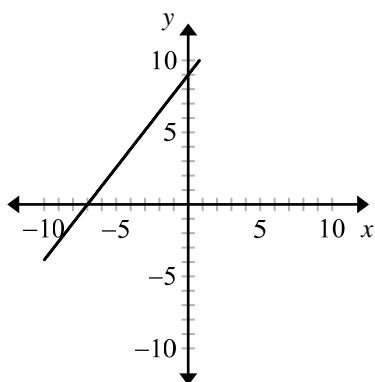
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17. Graph the linear equation $9x - 7y = 63$.

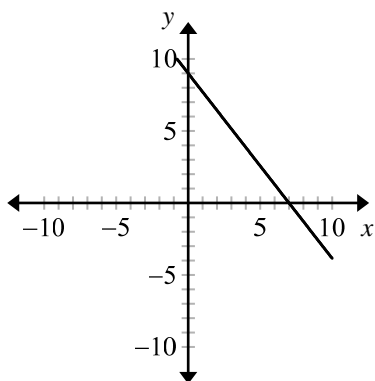
A.



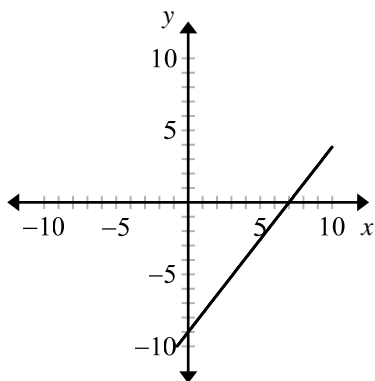
B.



C.



D.



18. Joe's pay (P) varies directly with the square of the number of widgets (w) he produces. When he produces 2 widgets, he is paid \$16. How many widgets would he have to produce to make \$144?

- A. 6
- B. 8
- C. 12
- D. 36

19. Evaluate $f(-3)$ for the piecewise function:

$$f(x) = \begin{cases} x, & x \leq 0 \\ x^2 - 3x, & x > 0 \end{cases}$$

- A. $f(-3) = -18$
- B. $f(-3) = -3$
- C. $f(-3) = 0$
- D. $f(-3) = 18$

20. Solve the following linear system.

$$\begin{cases} 5x - 2y = 8 \\ y = \frac{5}{2}x + 3 \end{cases}$$

- A. $(0, -4)$
- B. $(2, 8)$
- C. infinitely many solutions
- D. no solution

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21. Find the y -coordinate of the solution to the linear system.

$$\begin{cases} 3x - 4y = -1 \\ x + y = -5 \end{cases}$$

- A. -5
- B. -3
- C. -2
- D. no solution

22. What is the x -coordinate of the solution to the following system of equations?

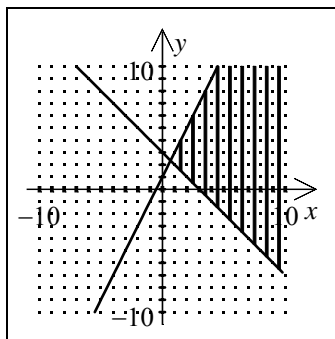
$$\begin{cases} 2x + y - z = 5 \\ x + 3z = 14 \\ -2x - 3y + 2z = 2 \end{cases}$$

- A. 14
- B. 5
- C. -1
- D. -2

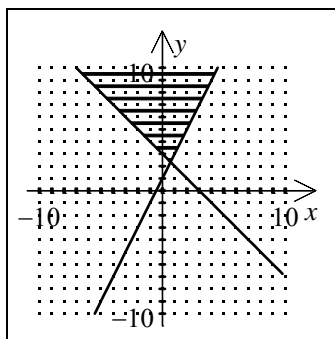
23. Graph the system of inequalities.

$$\begin{cases} y \leq 2x + 1 \\ y \geq -x + 3 \end{cases}$$

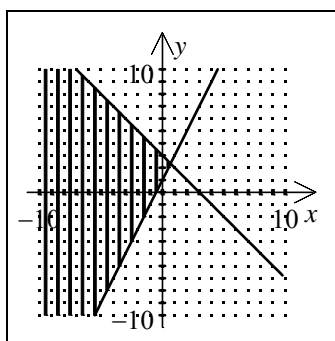
A.



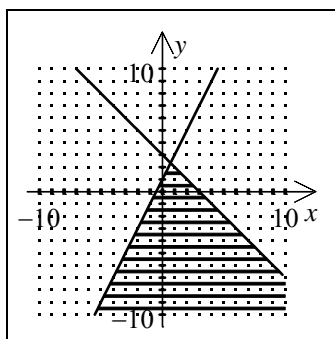
B.



C.



D.



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24. For one month of internet access, Southern Nevada Web charges \$4.00 per hour with a base fee of \$20.00. Silver State Internet does not charge a base fee, but charges \$6.00 per hour for internet access. In how many hours of use will the costs for the two companies be the same?

- A. 2 hours
- B. 10 hours
- C. 16 hours
- D. 24 hours

25. Using linear programming procedures, the equation $C = 4x + 7y$ is to be maximized subject to the following constraints:

$$x \geq 0$$

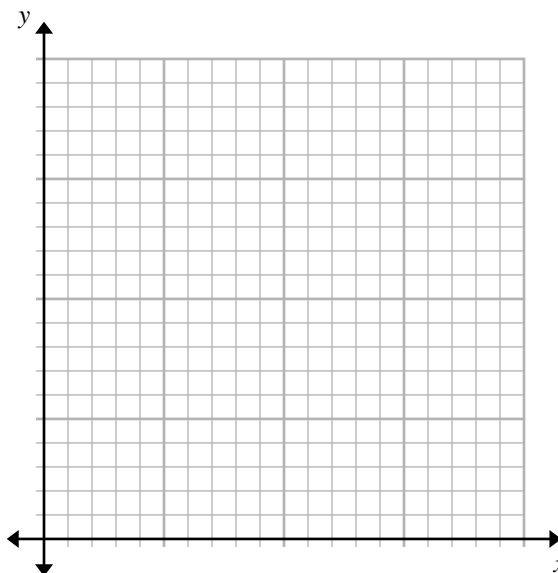
$$y \geq 0$$

$$x + y \geq 2$$

$$-3x + 4y \leq 8$$

$$2y \geq 5x - 10$$

The grid may be used to sketch the feasible region.



What is the minimum value for the objective function?

- A. 51
- B. 14
- C. 8
- D. 0

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26. A school fundraiser sells different sizes of gift baskets with a varying assortment of books and pencils. A *basic* basket contains 3 books and 4 pencils. A *big* basket contains 7 books and 8 pencils. Books cost \$5, and pencils cost \$2.

Which of the following shows the use of matrices to find the total cost for each size of basket?

- A. $\begin{bmatrix} 3 & 4 \\ 7 & 8 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix} = \begin{bmatrix} 26 \\ 54 \end{bmatrix}$
- B. $\begin{bmatrix} 3 & 4 \\ 7 & 8 \end{bmatrix} \begin{bmatrix} 5 \\ 2 \end{bmatrix} = \begin{bmatrix} 23 \\ 51 \end{bmatrix}$
- C. $\begin{bmatrix} 3 & 7 \\ 4 & 8 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix} = \begin{bmatrix} 41 \\ 48 \end{bmatrix}$
- D. $\begin{bmatrix} 3 & 7 \\ 4 & 8 \end{bmatrix} \begin{bmatrix} 5 \\ 2 \end{bmatrix} = \begin{bmatrix} 29 \\ 36 \end{bmatrix}$

27. Which is the sum $A + B$, given that

$$A = \begin{bmatrix} -9 & 2 & -3 \\ 1 & 5 & 8 \end{bmatrix} \text{ and}$$

$$B = \begin{bmatrix} -5 & 4 & 0 \\ -4 & -3 & -7 \end{bmatrix} ?$$

- A. $\begin{bmatrix} -14 & 6 & -3 \\ -3 & 2 & 1 \end{bmatrix}$
- B. $\begin{bmatrix} -14 & 6 & -3 \\ -3 & 2 & -1 \end{bmatrix}$
- C. $\begin{bmatrix} -4 & 6 & -3 \\ -3 & -8 & -1 \end{bmatrix}$
- D. $\begin{bmatrix} 14 & 6 & 3 \\ 5 & 8 & 15 \end{bmatrix}$

28. Given $A = \begin{bmatrix} 0 & 2 & 1 \\ -5 & -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -4 \\ 0 & 1 \\ 5 & -1 \end{bmatrix}$,

find the product AB .

- A. $\begin{bmatrix} 0 & -8 \\ -5 & 1 \end{bmatrix}$
- B. $\begin{bmatrix} 5 & 1 \\ -5 & 19 \end{bmatrix}$
- C. $\begin{bmatrix} 7 & -3 \\ -1 & 22 \end{bmatrix}$
- D. not possible

29. Calculate the determinant:

$$\begin{vmatrix} 2 & -3 & 0 \\ 4 & 1 & 3 \\ 0 & 5 & 2 \end{vmatrix}$$

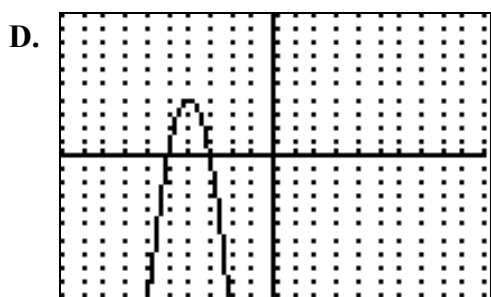
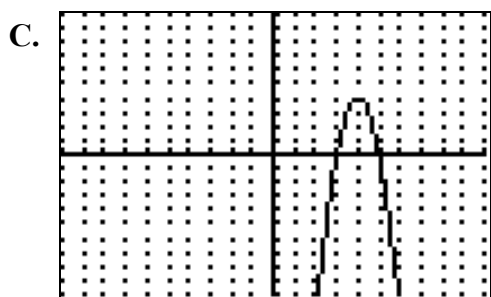
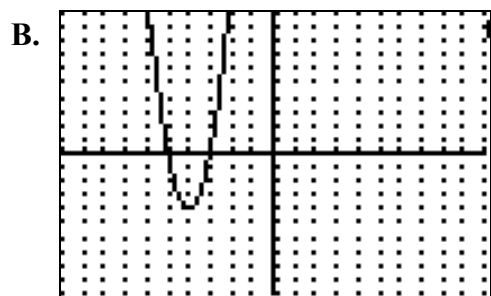
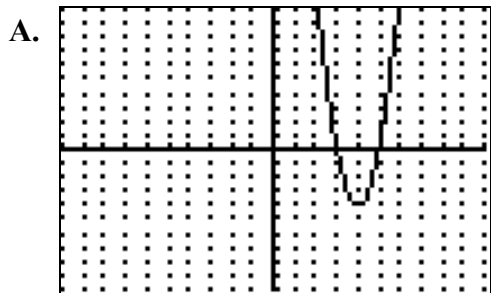
- A. -50
- B. -30
- C. -2
- D. 0

30. Solve for x and y : $\begin{bmatrix} 2 & -5 \\ -3 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -11 \\ 5 \end{bmatrix}$

- A. $(-8, 1)$
- B. $\left(-3, \frac{2}{3}\right)$
- C. $\left(\frac{11}{3}, \frac{5}{4}\right)$
- D. $(52, 23)$

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31. Which graph from a graphing calculator represents the function $y = -4(x^2 + 8x + 15)$? (Assume the scale on each graph is one unit per tick mark.)



32. Solve the equation $x^2 - 18x + 81 = 0$ by factoring.

- A. $x = \pm 9$
- B. $x = -9$
- C. $x = 9$
- D. no solution

33. Which is the solution set for $2x^2 + 7x + 1 = 0$, using the quadratic formula?

- A. $\left\{ \frac{7 + \sqrt{41}}{4}, \frac{7 - \sqrt{41}}{4} \right\}$
- B. $\left\{ \frac{7 + \sqrt{57}}{4}, \frac{7 - \sqrt{57}}{4} \right\}$
- C. $\left\{ \frac{-7 + \sqrt{57}}{4}, \frac{-7 - \sqrt{57}}{4} \right\}$
- D. $\left\{ \frac{-7 + \sqrt{41}}{4}, \frac{-7 - \sqrt{41}}{4} \right\}$

34. Which are solutions for $x^2 + 6x - 40 = 0$ when solved by completing the square?

- A. $x = 10$ or $x = 4$
- B. $x = 10$ or $x = -4$
- C. $x = -10$ or $x = 4$
- D. $x = -10$ or $x = -4$

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35. Which is the solution set of $(6x + 4)^2 = 77$?

- A. $\left\{ \frac{4 - \sqrt{77}}{12}, \frac{4 + \sqrt{77}}{12} \right\}$
- B. $\left\{ \frac{4 - \sqrt{77}}{6}, \frac{4 + \sqrt{77}}{6} \right\}$
- C. $\left\{ \frac{-4 - \sqrt{77}}{12}, \frac{-4 + \sqrt{77}}{12} \right\}$
- D. $\left\{ \frac{-4 - \sqrt{77}}{6}, \frac{-4 + \sqrt{77}}{6} \right\}$

36. Use the discriminant to determine the number and types of solutions of the equation $9x^2 - 30x + 25 = 0$.

- A. no real solutions, 2 imaginary solutions
- B. 1 real solution, no imaginary solutions
- C. 1 real solution, 1 imaginary solution
- D. 2 real solutions

37. What are the solutions of the quadratic equation $3x^2 + 5x = -4$?

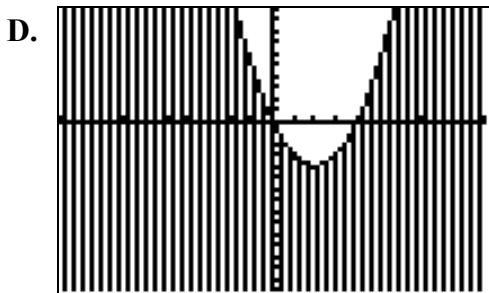
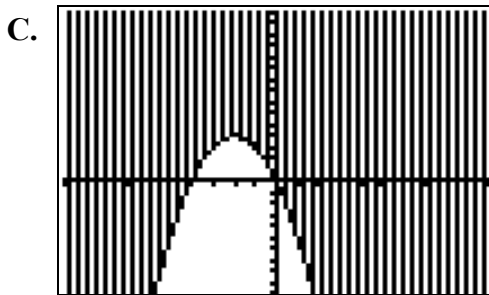
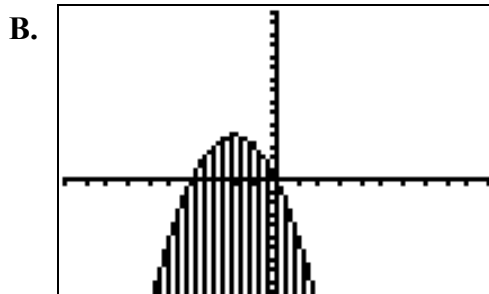
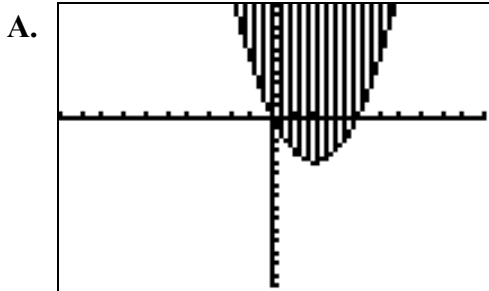
- A. $x = \frac{-5 + i\sqrt{23}}{6}, x = \frac{-5 - i\sqrt{23}}{6}$
- B. $x = \frac{-5 + i\sqrt{73}}{6}, x = \frac{-5 - i\sqrt{73}}{6}$
- C. $x = \frac{5 + i\sqrt{23}}{6}, x = \frac{5 - i\sqrt{23}}{6}$
- D. $x = \frac{5 + i\sqrt{73}}{6}, x = \frac{5 - i\sqrt{73}}{6}$

38. Write the expression $\frac{7 + 3i}{3 + 9i}$ as a complex number in standard form.

- A. $\frac{1}{12} - \frac{3}{4}i$
- B. $\frac{8}{15} - \frac{3}{5}i$
- C. $\frac{8}{15} + \frac{4}{5}i$
- D. $\frac{1}{12} + i$

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39. Which of the following screens from a graphing calculator represents $y \leq x^2 - 4x$? (Assume the scale on each graph is one unit per tick mark.)



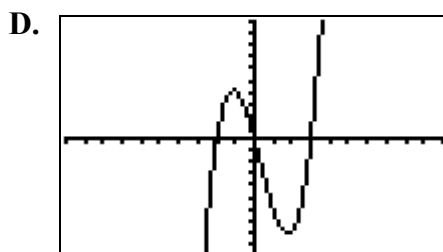
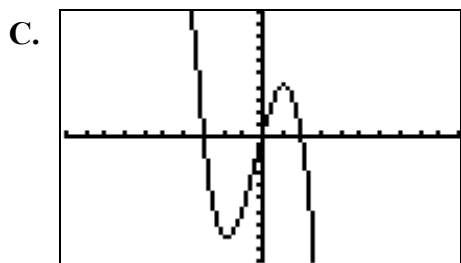
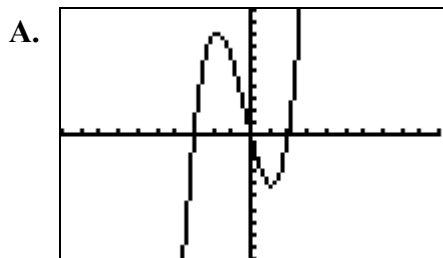
40. In the model $h = -16t^2 + v_0t + h_0$,
 h = height (in feet), h_0 = initial height (in feet), v_0 = initial velocity (in feet per second), and t = time (in seconds).

If $v_0 = 15$ feet per second and $h_0 = 6$ feet, what is the value of t (in seconds) when $h = 5$ feet?

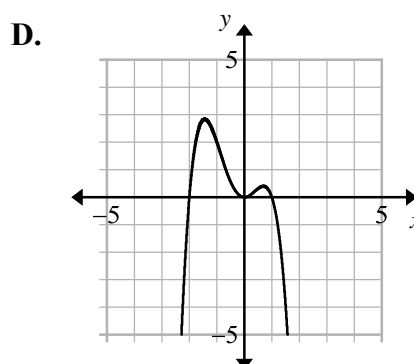
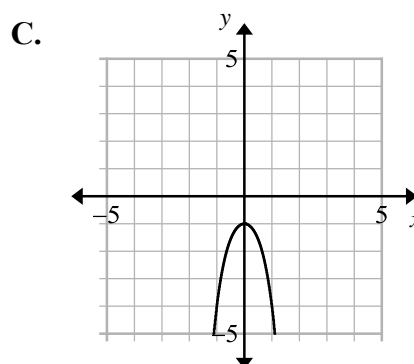
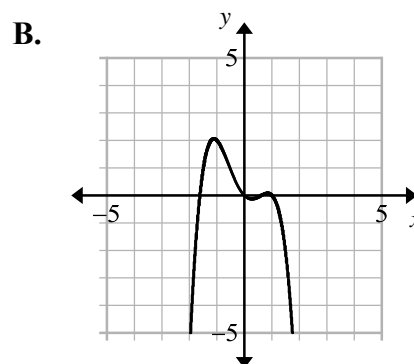
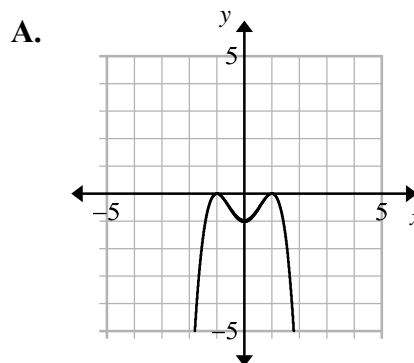
- A. $\frac{1}{16}$ second
- B. 1 second
- C. $1\frac{9}{16}$ seconds
- D. 2 seconds

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41. Which graph represents the factored function $f(x) = x(x-3)(x+2)$?
(Assume the scale on each graph is one unit per tick mark.)



42. Graph the polynomial function:
 $f(x) = -x^4 + 2x^2 - 1$



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43. Multiply the following polynomials.

$$(x+4)(x^2+x+4)$$

- A. $x^3 + x^2 + 16$
- B. $x^3 + 5x^2 + 8x + 16$
- C. $x^3 + 3x^2 + 8x + 16$
- D. $x^3 + 5x^2 + 16$

44. Factor the polynomial $x^4 - 8x^2 - 9$ completely.

- A. $(x-1)(x+1)(x^2+9)$
- B. $x^2(x^2-8)-9$
- C. $(x-3)(x+3)(x^2+1)$
- D. $(x+1)^2(x-3)(x+3)$

45. Factor the polynomial expression $8x^3 + 27$.

- A. $(2x+3)^3$
- B. $(2x-3)(2x+3)^2$
- C. $(2x+3)(4x^2-6x+9)$
- D. $(2x-3)(4x^2+6x+9)$

46. Which of the following represents the solution set of the polynomial equation below?

$$f(x) = 4x^3 - 8x^2 - x + 2$$

- A. $\left\{-\frac{1}{2}, \frac{1}{2}, 2\right\}$
- B. $\left\{-1, \frac{1}{2}, 2\right\}$
- C. $\{0, 1, 2\}$
- D. $\left\{-2, \frac{1}{2}, 2\right\}$

47. According to the *Fundamental Theorem of Algebra*, how many solutions does the polynomial $f(x) = -10 + 3x + 2x^3 - 4x^5$ have?

- A. 2
- B. 3
- C. 4
- D. 5

48. What is $x^3 - 3x^2 - 6$ divided by $x - 5$?

- A. $x^2 + 2x + 10 + \frac{44}{x-5}$
- B. $x^2 - 8x + 40 - \frac{206}{x-5}$
- C. $x^2 - 8x - \frac{46}{x-5}$
- D. $x^2 + 2x + \frac{4}{x-5}$

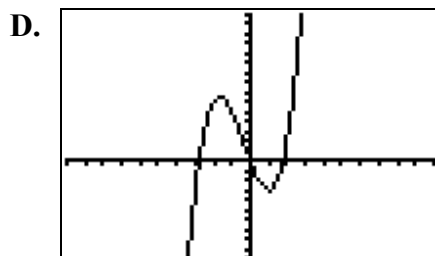
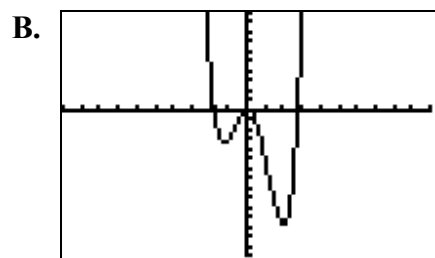
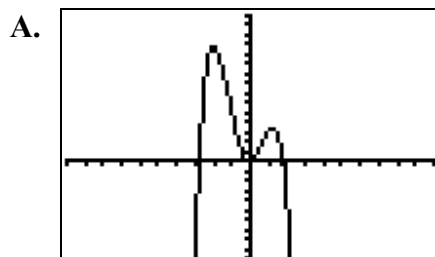
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49. State the end behavior of the graph of

$$f(x) = -x^3 + 7x + 4 \text{ as } x \rightarrow -\infty.$$

- A. $f(x) \rightarrow -\infty$
- B. $f(x) \rightarrow +\infty$
- C. $f(x) \rightarrow 4$
- D. $f(x) \rightarrow 0$

50. Which best represents the polynomial function $y = x^4 - x^3 - 5x^2$? (Assume the scale on each graph is one unit per tick mark.)



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Free Response

1. Let $p(x) = x(x-3)^2(x+1)$.

A. Sketch the graph of $p(x)$. Label all intercepts.

B. Find another polynomial function, $q(x)$, that has the same zeros as $p(x)$ and goes through the point $(1, -16)$.

C. Explain how to determine the end behaviors of a polynomial function.

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Free Response**

2. Let $f(x) = x^2 + 2x - 15$.

A. Find the vertex and the axis of symmetry.

B. $(0, -15)$ is a point on $y = f(x)$. Explain how you can use the symmetric properties of a parabola to find another point on $y = f(x)$.

C. Sketch the graph of $y = f(x)$. Include and label at least 5 points on your graph including the vertex and intercepts.

D. Find the domain and range of $f(x)$.

Applied Algebra II Semester 1 Practice Exam A Free Response

3. A bakery chain displays prices in a 1×3 matrix and daily sales at its three stores in a 3×3 matrix as shown below:

Prices			Number of Items Sold		
Cupcakes	Cookies	Cakes	Store A	Store B	Store C
[	\$2	\$1	\$10]	
Cupcakes	[	12	10	20]
Cookies	[	25	40	80]
Cakes	[	6	4	12]

- A. Find the product of the two matrices. Explain what the product represents.

- B. How would you find the total gross revenue from all three stores?

