Name _____ Date _____ Period _____

Algebra 2 Honors Semester 1 Practice Final

Polynomial Identities:

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

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

Matrices:

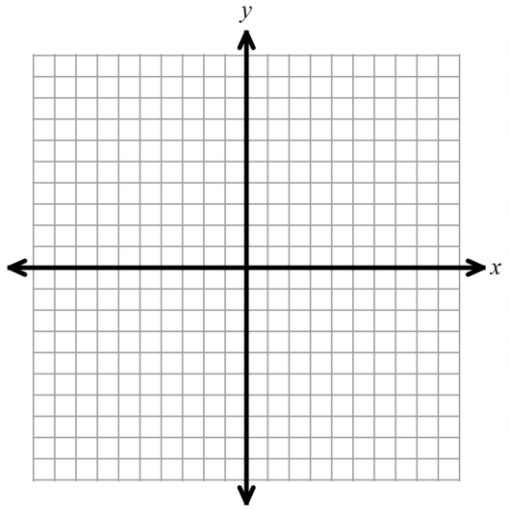
Identity Matrix: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

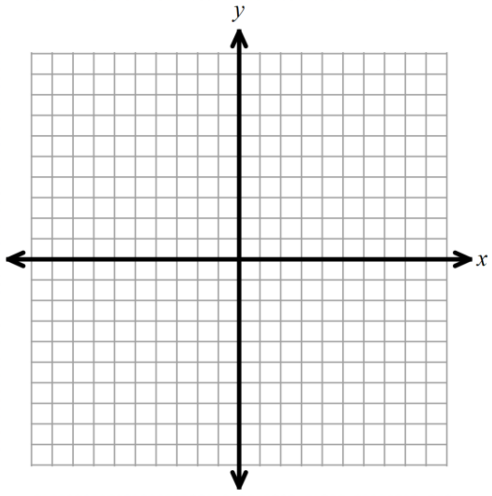
Inverse Matrix: $\begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} d & e \\ f & g \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\det A = ad - bc$

$A^{-1} = \frac{1}{\det A}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

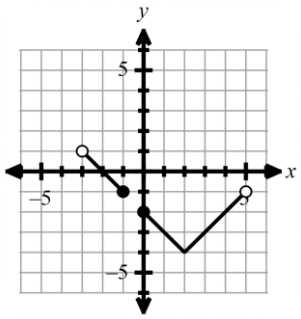
Student Work Area:





1. Which of the following graphs shows a function over the domain $[-3,\ -1) \cup (0, 5]$?

A.



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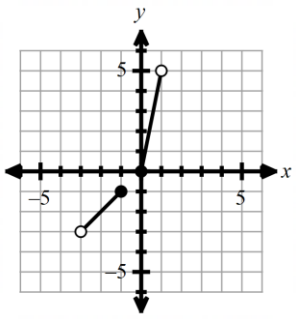

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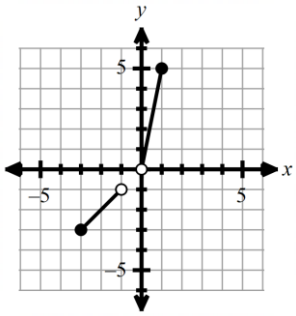

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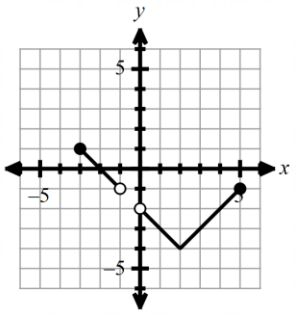
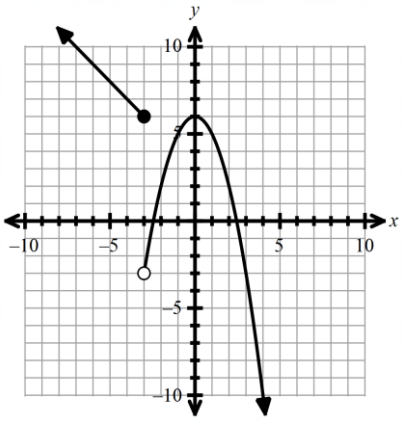
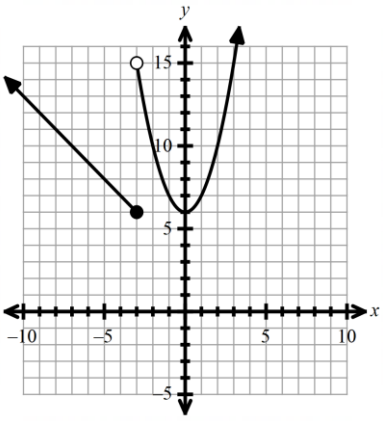


2. Graph the function $f(x) = \begin{cases} -x + 3, & x \leq -3 \\ -x^2 + 6, & x > -3 \end{cases}$

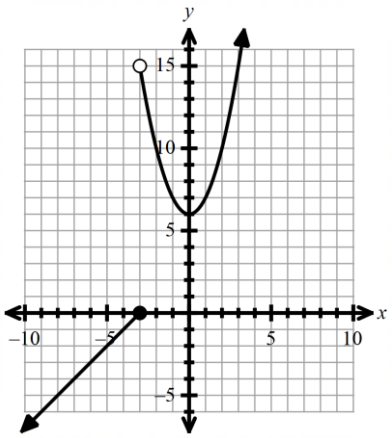
A.



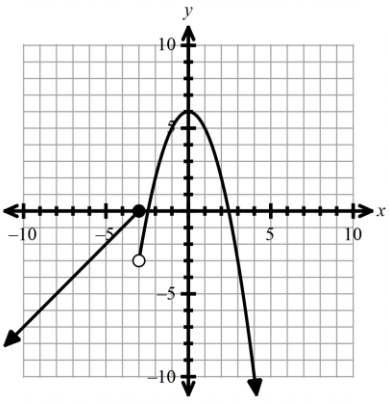
C.



B.



D.



3. Given that $f(x) = 6x + 5$ and $g(x) = 4x^2$, identify the expression that represents $f(g(x))$.

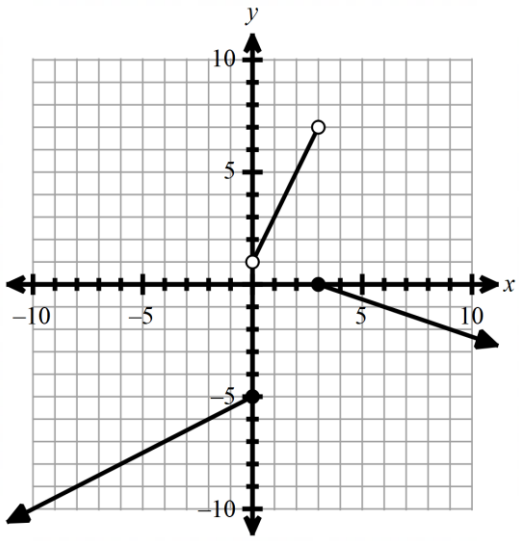
A. $36x^2 + 12x + 25$

B. $24x^2 + 5$

C. $4x^2 + 5$

D. $8x^2 + 128$

4. Write the piecewise function for the graph below:



A. $f(x) = \begin{cases} \frac{1}{2}x - 5, & x \le 0 \\ -\frac{1}{3}x + 1, & 0 < x < 3 \\ 2x + 1, & x \ge 3 \end{cases}$

B. $f(x) = \begin{cases} \frac{1}{2}x - 5, & x \le 0 \\ 2x + 1, & 0 < x < 3 \\ -\frac{1}{3}x + 1, & x \ge 3 \end{cases}$

C. $f(x) = \begin{cases} -\frac{1}{3}x + 1, & x \le 0 \\ 2x + 1, & 0 < x < 3 \\ \frac{1}{2}x - 5, & x \ge 3 \end{cases}$

D. $f(x) = \begin{cases} \frac{1}{2}x - 5, & x \le 0 \\ 2x + 1, & 0 \le x \le 3 \\ -\frac{1}{3}x + 1, & x \ge 3 \end{cases}$

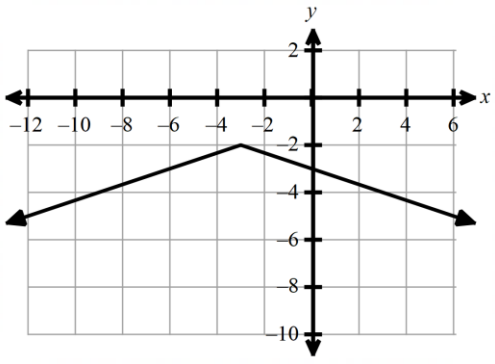
5. Which equation is obtained after the graph below is translated 4 units to the left and 5 units up?

A. $f(x) = -\frac{1}{3}|x + 7| + 3$

B. $f(x) = -\frac{1}{3}|x - 1| + 3$

C. $f(x) = -3|x + 7| + 3$

D. $f(x) = -3|x - 1| + 3$



6. Solve $(x+4)^2 - 3 = -|x-1| + 8$.

A. $x = -6$ and $x = -1$

B. $x = 1$ and $x = 6$

C. $x = 1$

D. $x = -6$

7. Solve $-\frac{1}{2}|x+1| + 4 \geq 0$.

A. $-3 \leq x \leq 1$

B. $-9 \leq x \leq 7$

C. $x \leq -3$ or $x \geq 1$

D. $x \leq -9$ or $x \geq 7$

8. Solve the following system for z:

$$\begin{cases} x + 2y - z = 5 \\ -3x - 2y - 3z = 11 \\ 4x + 4y + 5z = -18 \end{cases}$$

A. $z = 0$

B. $z = -2$

C. $z = -4$

D. $z = 8$

9. Which matrix is the additive inverse of $A = \begin{bmatrix} -5 & 3 \\ -10 & 8 \\ 25 & 1 \end{bmatrix}$

A. $\begin{bmatrix} 5 & -3 \\ 10 & -8 \\ -25 & -1 \end{bmatrix}$

B. $\begin{bmatrix} -5 & -10 & 25 \\ 3 & 8 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 3 & -5 \\ 8 & -10 \\ 1 & 25 \end{bmatrix}$

D. $\begin{bmatrix} 3 & 8 & 1 \\ -5 & -10 & 25 \end{bmatrix}$

10. Find the product of $\boldsymbol{SR}$, given $R = \begin{bmatrix} 12 & 3 \\ -4 & -2 \end{bmatrix}$ and $S = \begin{bmatrix} -7 & 15 \\ 11 & 5 \end{bmatrix}$.

A. $\begin{bmatrix} -39 & -2 \\ 147 & -54 \end{bmatrix}$

B. $\begin{bmatrix} -51 & 225 \\ 6 & -70 \end{bmatrix}$

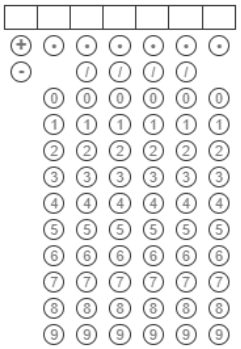
C. $\begin{bmatrix} -84 & 45 \\ -44 & -10 \end{bmatrix}$

D. $\begin{bmatrix} -144 & -51 \\ 112 & 23 \end{bmatrix}$

11. Find the value of y below:

$$\begin{bmatrix} 15 & 12 \\ 5x & 0 \end{bmatrix} + \begin{bmatrix} 13 & 9 \\ x & 2y+4 \end{bmatrix} = \begin{bmatrix} 28 & 21 \\ 36 & 3y+6 \end{bmatrix}$$

Round your answer to the nearest tenth if needed. Bubble your answer in the grid below.



12. Three matrices are given below.

$X = \begin{bmatrix} -2 & 0 \\ 5 & 7 \end{bmatrix}$ $Y = \begin{bmatrix} -1 & 3 \\ -5 & 8 \end{bmatrix}$ $Z = \begin{bmatrix} 11 & 3 \\ 5 & -7 \end{bmatrix}$

Which of the following statements are true? Select all that apply.

F. $(X+Y)Z = XZ + YZ$

G. $XY = YX$

H. $-5(XY) = (-5X)Y$

I. $X(Y+Z) = XY + XZ$

J. $X + Y = Y + X$

K. $Y - Z = Z - Y$

13. Which of the following operations will reflect the vector $\langle 3, -2 \rangle$ across the *y*-axis?

A. $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ -2 \end{bmatrix}$

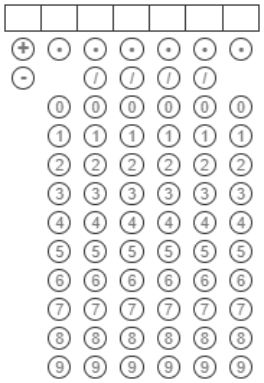
B. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ -2 \end{bmatrix}$

C. $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ -2 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ -2 \end{bmatrix}$

14. Find the value of $\det B$, given $B = \begin{bmatrix} -27 & 18 \\ -5 & 7 \end{bmatrix}$

Round your answer to the nearest tenth if needed. Bubble your answer in the grid below.



15. Find the inverse of $M = \begin{bmatrix} 4 & 2 \\ 10 & -5 \end{bmatrix}$.

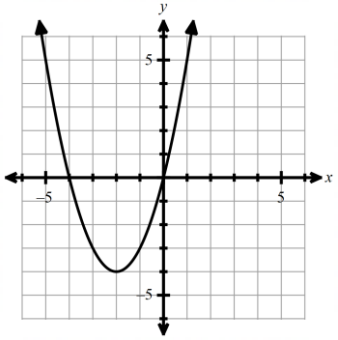
A. $M^{-1} = \begin{bmatrix} -\frac{1}{10} & \frac{1}{20} \\ -\frac{1}{4} & -\frac{1}{8} \end{bmatrix}$

B. $M^{-1} = \begin{bmatrix} 200 & 80 \\ 400 & -160 \end{bmatrix}$

C. $M^{-1} = \begin{bmatrix} \frac{1}{8} & \frac{1}{20} \\ \frac{1}{4} & -\frac{1}{10} \end{bmatrix}$

D. M^{-1} does not exist

16. Compare the two functions represented below. Determine which of the following statements is true.

Function $f(x)$	Function $g(x)$
	$g(x) = -(x-8)^2 - 4$

A. The functions have the same vertex.

B. The minimum value of $f(x)$ is the same as the maximum value of $g(x)$.

C. The functions have the same axis of symmetry.

D. The minimum value of $f(x)$ is less than the maximum value of $g(x)$.

17. The function $h(x)$ is the result of translating the parent function $f(x) = x^2$ left 7 units and up 9 units. Which of the following equations represent $h(x)$? Select all that apply.

F. $h(x) = (x-7)^2+9$

G. $h(x) = (x-9)^2 - 7$

H. $h(x) = (x+7)^2+9$

I. $h(x) = x^2 - 14x + 49$

J. $h(x) = x^2 + 14x + 58$

K. $h(x) = x^2 - 18x + 74$

18. Given $(x) = 4\left(x - \frac{2}{7}\right)^2 + \frac{1}{9}$, identify the domain and range of the function.

A. Domain: $(-\infty, +\infty)$
Range: $\left(-\infty, -\frac{2}{7}\right)$

B. Domain: $[-\infty, +\infty]$
Range: $\left[\infty, -\frac{2}{7}\right]$

C. Domain: $(-\infty, +\infty)$
Range: $(\infty, 4)$

D. Domain: $(-\infty, +\infty)$
Range: $\left[\frac{1}{9}, \infty\right)$

19. Which of the following is the quadratic equation for a parabola with a vertex of $(-8, 2)$ going through the point $(-13, 12)$?

A. $y = -\frac{10}{441}(x+8)^2 + 2$

B. $y = -\frac{2}{5}(x-8)^2 + 2$

C. $y = \frac{2}{5}(x+8)^2 + 2$

D. $y = \frac{10}{441}(x-8)^2 + 2$

20. A parabola has *x*-intercepts at -3 and 7and goes through the point $(-5, 6)$. What other point is on the parabola?

A. $(-8, 42)$

B. $(-1, 22)$

C. $(8, 44)$

D. $(11, 14)$

21. Which of the following statements describe key features of $f(x) = \frac{1}{3}x^2 + 6x - 8$? Select all that apply.

F. The axis of symmetry is $x = -1$.

G. The minimum is $y = -8$.

H. The axis of symmetry is $x = -9$.

I. The minimum is $y = -35$.

J. The *y*-intercept is $(0, 6)$.

K. The vertex is $(-6, -8)$.

L. The *y*-intercept is $(0, -8)$.

M. The vertex is $(-9, -35)$.

22. Which of the following functions represent the parabola opening upwards with a compression factor of $\frac{1}{4}$ and x-intercepts $(-4, 0)$ and $(6, 0)$.

I.	$y = \frac{1}{4}(x + 4)(x - 6)$
II.	$y = \frac{1}{4}x^2 + \frac{5}{2}x - 6$
III.	$y = 4(x - 4)^2 + 6$
IV.	$y = \frac{1}{4}x^2 - \frac{1}{2}x - 6$
V.	$y = \frac{1}{4}(x - 1)^2 - \frac{25}{4}$

A. Options I, IV, and V

B. Options I, III, and V

C. Options I, III, and IV

D. Options II, IV, and V

23. Simplify the expression: $-3i \cdot \sqrt{-28}$

A. $6\sqrt{7}$

B. $-6\sqrt{7}$

C. $-i\sqrt{7}$

D. $\sqrt{7}$

24. Which radical expression is represented by the complex number $10 + 8i$?

A. $10 + \sqrt{-16}$

B. $10 - \sqrt{-16}$

C. $10 + \sqrt{-64}$

D. $10 - \sqrt{-64}$

25. Simplify: $4i(10 + i) - 6(2 - 3i)$

A. $28 + 22i$

B. $-16 + 58i$

C. $-8 + 58i$

D. $8 + 22i$

26. Simplify: $(i\sqrt{7}+8)(i\sqrt{7}-8)$

A. $7i-64$

B. $i\sqrt{7}-64$

C. -57

D. -71

27. Simplify: $\frac{2i(6-4i)}{3+3i}$

A. $4i$

B. $\frac{8}{3}+4i$

C. $60+\frac{2}{3}i$

D. $\frac{10}{3}+\frac{2}{3}i$

28. Given $f(x)=2x^2+16x+18$, find the value of k if the function is written in vertex form, $f(x)=a(x-h)^2+k$. Show your work and write your answer below.

29. What are the solutions to the quadratic equation, $3x^2+21x=5x-60$?

A. $x=\frac{-8\pm 4i\sqrt{29}}{3}$

B. $x=\frac{-8\pm 2i\sqrt{29}}{3}$

C. $x=\frac{-8\pm 2i\sqrt{61}}{3}$

D. $x=\frac{-8\pm i\sqrt{61}}{2}$

30. What are the x-coordinates of the points of intersection given the system below?

$$\begin{cases} x^2+6x+5y+16=0 \\ 2x+y=-3 \end{cases}$$

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

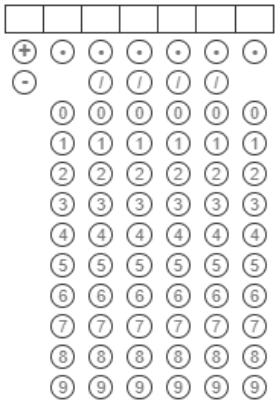
B. $x=2+i\sqrt{15}, x=2-i\sqrt{15}$

C. $x=4+2\sqrt{3}, x=4-2\sqrt{3}$

D. $x=-8+\sqrt{33}, x=-8-\sqrt{33}$

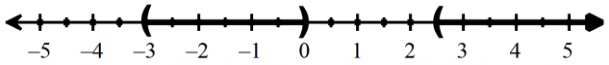
31. A water balloon is launched in an experiment. The height of the water balloon is modeled by the equation $h = -16t^2 + v_0t + h_0$ where t is time in seconds, h is the height above the ground, h_0 is the initial height, and v_0 is the initial velocity. The balloon is launched from a $15\ foot$ high platform at an initial velocity of $50\ ft/sec$. At what time does the balloon reach the maximum height? Round your answer to the nearest tenth if necessary.

Bubble your answer in the grid provided below.



32. The function $f(x) = \frac{1}{2}x^3 + \frac{1}{4}x^2 - \frac{15}{4}x$ is graphed below. Over which intervals of x is the graph positive?

A.



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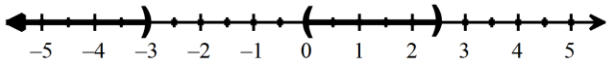

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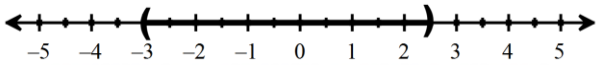

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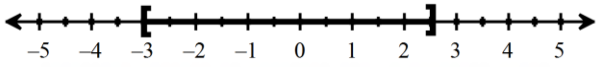
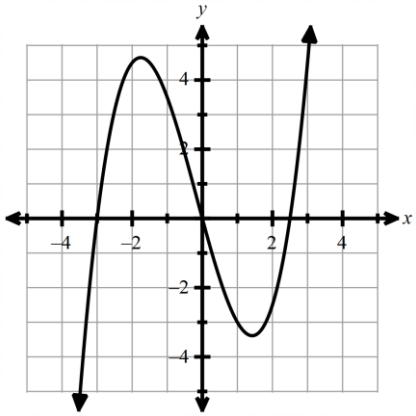
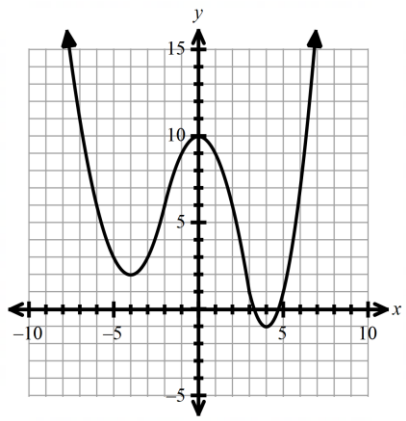




33. Based on the function graphed below, which statements are true? Select all that apply



F. The function is always decreasing over the interval $(-\infty, \infty)$.

G. The function is always increasing over the interval $(-4, 4)$.

H. The function is always increasing over the interval $(-4, 0)$.

I. The function has a relative minimum value of 0.

J. The function has a relative minimum value of -1.

34. Let $f(x) = -6(x-7)^2$ and $g(x) = 4(x-5)^2$. Which of the following is equivalent to $f(x) - g(x)$?

A. $-10x^2 + 394$

B. $-10x^2 + 44x - 194$

C. $-10x^2 + 124x - 394$

D. $100x^2 + 440x + 484$

35. Multiply: $(2x^2 + 4x - 5)(-x^2 + 3x + 6)$

A. $-2x^4 + 2x^3 + 29x^2 + 9x - 30$

B. $2x^4 + 10x^3 + 19x^2 + 9x - 30$

C. $-2x^4 + 9x^2 + 21x - 30$

D. $-2x^4 + 24x^2 - 30$

36. Factor the following using imaginary numbers: $9x^2 + 49$

A. $(3x - 7i)^2$

B. $(\sqrt{3}x + 7i)(\sqrt{3}x - 7i)$

C. $(3x + 7i)(3x - 7i)$

D. $(3x + 7i)^2$

37. Factor: $125x^3 - 343$

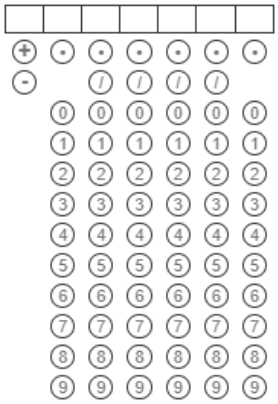
A. $(5x - 7)(5x^2 + 35x + 7)$

B. $(5x - 7)(5x^2 + 35x - 7)$

C. $(5x - 7)(25x^2 + 35x + 49)$

D. $(5x - 7)(25x^2 - 35x - 49)$

38. What is the remainder in the division $(6x^3 - x^2 + 4x - 9) \div (2x - 3)$? Bubble your answer in the grid provided below.



39. Find the quotient of $(3x^3 - 44x + 8) \div (x - 4)$?

A. $3x^2 - 12x + 4$

B. $3x^2 - 12x + 4 + \frac{-8}{x - 4}$

C. $3x^2 - 32 + \frac{-120}{x - 4}$

D. $3x^2 + 12x + 4 + \frac{24}{x - 4}$

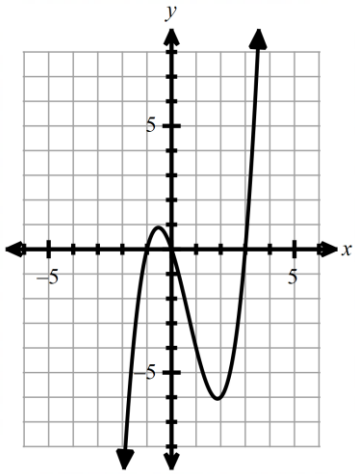
40. Which polynomial is graphed on the right?

A. $f(x) = (x + 1)(x - 3)$

B. $f(x) = (x - 1)(x + 1)(x + 3)$

C. $f(x) = x(x - 3)(x + 1)$

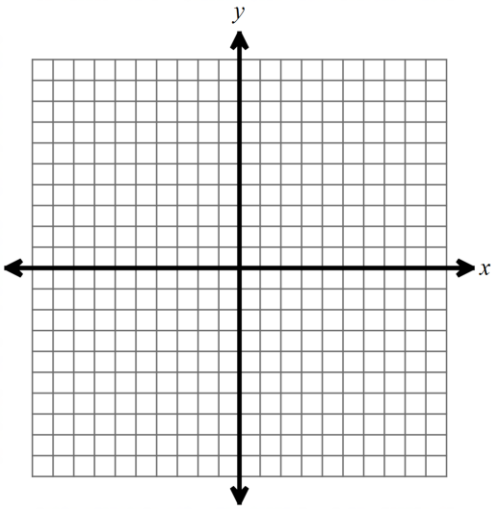
D. $f(x) = x(x + 3)(x - 1)$



41. Sketch the graphs of $f(x)$ and $g(x)$ on the same coordinate plane given the following information:

- $f(x)$ has zeros at $-1, 4, 8$
- As $x \to -\infty$, $f(x) \to +\infty$ and as $x \to +\infty$, $f(x) \to -\infty$
- $f(x)$ has a local minimum at approximately $(1, -4)$ and a local maximum at approximately $(6, 3)$
- $g(x) = 2x + 1$

How many real solutions exist when $f(x) = g(x)$?



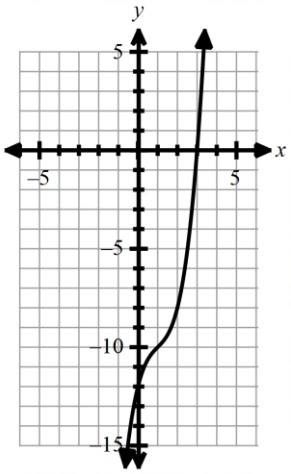
A. *no real solution*

B. 1 *real solution*

C. 2 *real solutions*

D. 3 *real solutions*

42. The equation $x^3 - 3x^2 + 4x - 12 = 0$ is graphed below. Use the graph to help solve the equation and find all the roots of the function.



A. $x = 3, -2, 2$

B. $x = -12, 1, 3$

C. $x = 3, -2i, 2i$

D. $x = 12, \frac{3 - i\sqrt{7}}{2}, \frac{3 + i\sqrt{7}}{2}$

43. What is the end behavior for the function, $f(x) = (x^4 - 5x - 3)(-9x^5 + 6x^3)$?

A. as $x \to -\infty$, $f(x) \to -\infty$ and as $x \to +\infty$, $f(x) \to +\infty$

B. as $x \to -\infty$, $f(x) \to +\infty$ and as $x \to +\infty$, $f(x) \to +\infty$

C. as $x \to -\infty$, $f(x) \to -\infty$ and as $x \to +\infty$, $f(x) \to -\infty$

D. as $x \to -\infty$, $f(x) \to +\infty$ and as $x \to +\infty$, $f(x) \to -\infty$

44. Solve: $10y^3 - 4y^2 - 2y = -5y^3 + 3y^2$

A. $y = -3, y = 0, y = 10$

B. $y = -\frac{1}{5}, y = 0, y = \frac{2}{3}$

C. $y = 0, y = \frac{1 \pm \sqrt{41}}{10}$

D. $y = 0$

45. Find all of the zeros of $f(x) = x^3 - 3x^2 + 4x - 2$.

A. $x = 1 + i, 1 - i, 1$

B. $x = 1$

C. $x = -2, -1, 1, 2$

D. $x = -1, -2i, 2i$

46. Write a polynomial function of least degree that has rational coefficients, a leading coefficient of 1, and the zeros $3i, \sqrt{2}, -4$.

A. $f(x) = x^5 - 4x^4 + 7x^3 + 28x^2 - 18x - 76$

B. $f(x) = x^5 - 4x^4 - 13x^3 - 52x^2 + 36x + 144$

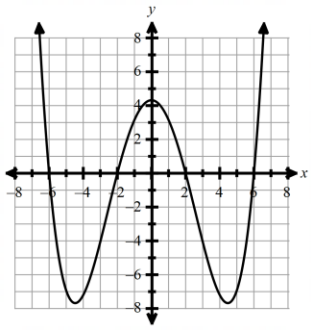
C. $f(x) = x^5 + 4x^4 + 7x^3 + 28x^2 - 18x - 72$

D. $f(x) = x^6 - 9x^4 - 130x^2 + 288$

47. Which of the following functions is odd?

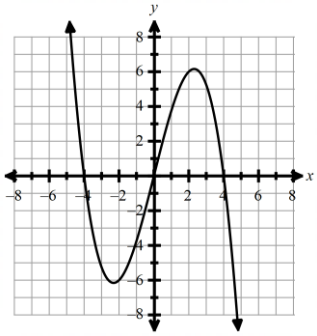
A. $f(x) = 6x^7 - 5x^4 + 8$

B.

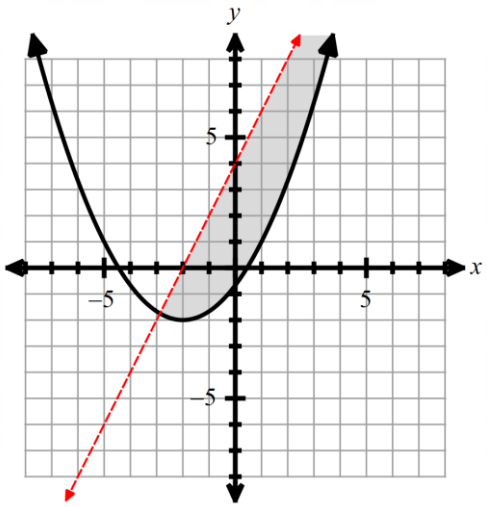


C. $f(x) = -3x^6 + 9$

D.



48. Which of the following represents the system of inequalities below?



A. $\begin{cases} y > \frac{1}{3}(x+2)^2 - 2 \\ y \leq 2x + 4 \end{cases}$

B. $\begin{cases} y \geq \frac{1}{3}(x+2)^2 - 2 \\ y < 2x + 4 \end{cases}$

C. $\begin{cases} y \geq \frac{1}{3}(x-2)^2 - 2 \\ y < -2x + 4 \end{cases}$

D. $\begin{cases} y \leq \frac{1}{3}(x+2)^2 - 2 \\ y > 2x + 4 \end{cases}$

PRACTICE FINAL 2022-23 Answers					
1.	**D**	**HSF.IF.B.5**	**14.**	**-99**	HSN.VM.C.7(+)
2.	A	**HSF.IF.B.5**	**15.**	**C**	HSN.VM.C.8(+)
3.	**B**	**HSF.IF.C.7b**	**16.**	**B**	HSN.VM.C.8(+)
4.	**B**	**HSF.IF.B.5**	**17.**	**H,J**	HSN.VM.C.8(+)
5.	**A**	HSF.LE.A.2 **HSF.IF.C.7b**	**18.**	**D**	HSN.VM.C.9(+)
6.	**A**	**HSF.BF.B.3**	**19.**	C	HSN.VM.C.10(+)
7.	**B**	**HSF.IF.B.4**	**20.**	D	HSN.VM.C.11(+)
8.	C	HSF.IF.B.6	**21.**	H,I,L,M	HSN.VM.10(+)
9.	A	**HSA.CED.A.1**	**22.**	A	HSN.VM.10(+)
10.	B	HSA.REI.D.11	**23.**	A	HSA.REI.C.9
11.	-2	HSA.REI.D.11	**24.**	**C**	HSA.REI.C.8
12.	**F,H,I,J**	HSA.REI.C.6	**25.**	**B**	HSA.REI.C.9
13.	**C**	HSA.REI.C.6	**26.**	D	HSA.REI.C.9

PRACTICE FINAL ANSWERS					
27.	D	**HSF.IF.B.4**	**40.**	C	HSN.CN.A.2
28.	**-14**	**HSF.BF.B.3**	**41.**	B	HSN.CN.A.3(+)
29.	B	**HSF.IF.B.4**	**42.**	C	HSA.SSE.A.3b
30.	A	HSA.CED.A.2	**43.**	**D**	HSA.REI.B.4a
31.	3.1 SEC	**HSF.IF.B.4** **HSF.IF.C.7**	**44.**	B	HSA.REI.B.4b **HSN.CN.C.7**
32.	A	**HSF.HSF.IF.B.4**	**45.**	A	HSA.CED.A.2 **HSN.CN.C.7**
33.	H,J	HSA.CED.A.2	**46.**	C	HSA.CED.A.2 HSA.REI.B.4
34.	C	HSA.CED.A.2 **HSA.APR.B.3**	**47.**	D	HSA.REI.C.7
35.	A	**HSF.IF.B.4**	**48.**	**B**	HSA.REI.C.7 HSA.REI.D.11
36.	C	HSA.CED.A.2 **HSA.APR.B.3**			
37.	C	**HSN.CN.A.1**			
38.	15	**HSN.CN.A.1**			
39.	D	HSN.CN.A.2			