NO CALCULATORS OR CELL PHONES ALLOWED.

- **You must show ALL work on this paper to receive credit.**
  If you use scratch paper, you MUST transfer your work to this test.
- **All cell phones must be stored in a bag.**
  If you are caught with a cell phone, you will receive a 0 for the test.

Part I. Answer all problems in this section. No partial credit will be given.

[4 points each]

1. Complete the following table:

Inequality	Interval notation
a)	$[-4, \infty)$
$x \neq -3$	b)
$-1 < x < 5$	c)
d)	$(-\infty, 6)$

2. Simplify. Express answers using only positive exponents.

a) $\frac{x^{-2}}{x^{-4}}$

b) $\frac{x^9\, y^{-3}}{x^6}$

3. Find the midpoint of the line segment with endpoints:

$(-1, -3)\ and\ (-1, -6)$

4. State the vertex and concavity (up or down) of the equation:

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

Vertex: Concavity:

5. Find the radius of a circle with center $(3, 1)$ and a point on the circle is $(-1, 5)$.

6. Use log properties to express the following as a single logarithmic expression.

$\log_4(x + 4) - 6\log_4 y$

Part II. Answer all problems in this section.
Some partial credit will be given for correct work shown.

7. [6 pts.] Simplify the following. Write your answer in $a + bi$ form.

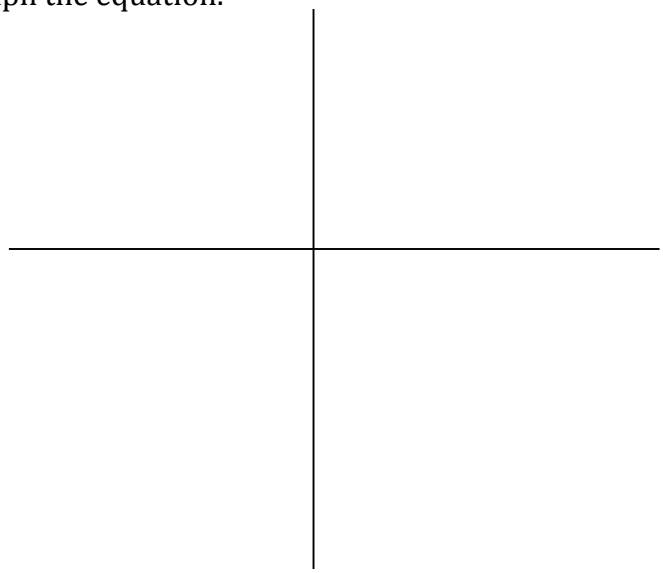
a) $\sqrt{-20} =$ _____ b) $(-2i)^3 =$ _____

8. [6 pts.] Given the point $(-3, 7)$, on the graph $f(x)$, find the corresponding point:

a. Symmetric to the origin	b. On the graph of $y = f(x + 2)$	c. On the graph of $y = f(x) - 2$

9. [6 points] State the intercepts and graph the equation.
Label the intercepts on the graph.

$2x - 3y = 9$



x-intercept: _____

y-intercept: _____

10. [6 points] Factor completely. **Do not solve**.

a) $x^2 - 10x + 21$

b) $4x^2 + 4x - 8$

11. [6 points] Find the inverse function $f^{-1}(x)$. Show all work.

a. $f(x) = 6x - 10$

b. $f(x) = \sqrt[3]{5x + 7}$

12. [6 points] A motorboat took 2 hours to make a downstream trip with a 5 mph current. The return trip against the current took 4 hours. Find the speed of the boat in still water.

13. [6 points] Let $f(x) = x^2 + 2x$. Find the difference quotient: $\frac{f(x+h)-f(x)}{h}$

14. [6 points] Write the equation of the line, in standard form ($Ax + By = C$), which passes through the points $(2, -1)$ and $(-3, 4)$.

15. [6 points] Solve the system.

$$\begin{cases} x + 2y = 5 \\ 8x + 3y = -25 \end{cases}$$

16. [20 points] Solve for x.

a) $\frac{3}{4}x > x + 5$

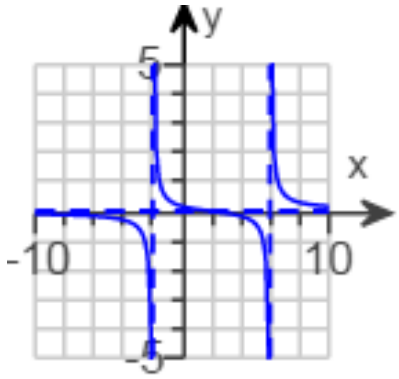
b) $\sqrt{3x + 4} = 5$

c) $2 \cdot 2^{x-1} = \frac{1}{4}$

d) $\log_3(10x - 12) = 3$

17. [8 points] Given a function and its graph, answer the following questions.

$f(x) = \frac{x-2}{x^2-4x-12}$



a) What is the domain?

b) What is the x-intercept?

c) What is the y-intercept?

d) On what interval is $f(x) > 0$?

18. [8 pts.] Complete the following function operations. Simplify your answer, but do not try to factor your answer.

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

a) $f(2p) =$

b) $(f - g)(x) =$

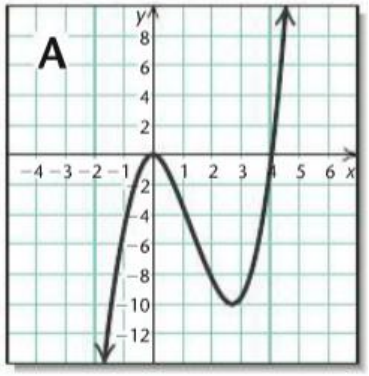
c) $(f \circ g)(-1) =$

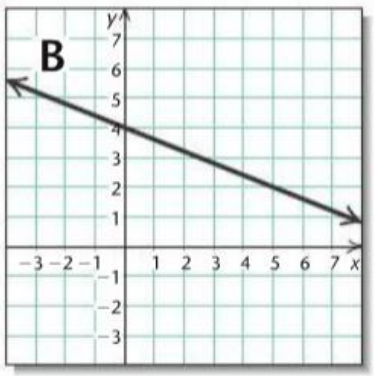
d) $(f + g)(2) =$

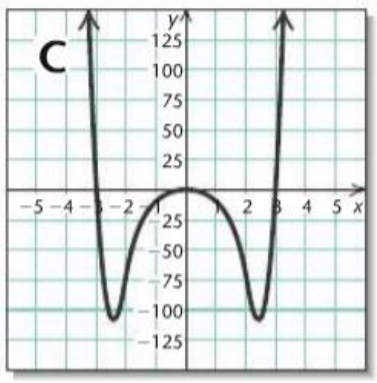
19. [8 points] Write the letter of the correct graph on the line by the function.

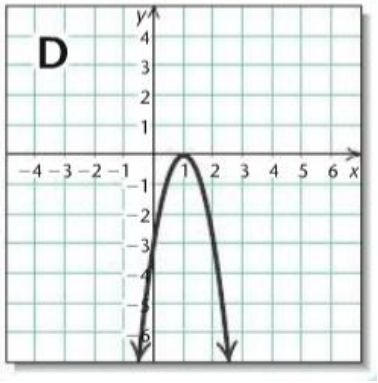
_____ $f(x) = -\frac{2}{5}x + 4$ _____ $f(x) = x^3 - 4x^2$

_____ $f(x) = -3x^2 + 6x - 3$ _____ $f(x) = x^6 - 9x^4$









20. [8 points] Solve the inequality. Write your answer in interval notation.

$|2x + 4| - 1 > 15$

21. [8 pts.] Find all the zeros (both real and complex) of the function:

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

a. Find 1 rational zero

b. Find the other zeros of $f(x)$. Simplify your answer.

22. [8 points] Solve for x. Find all solutions, both real and complex. Simplify your answer.

a) $x^3 - 4x^2 + 9x - 36 = 0$

b) $x^4 - 4x^2 - 32 = 0$

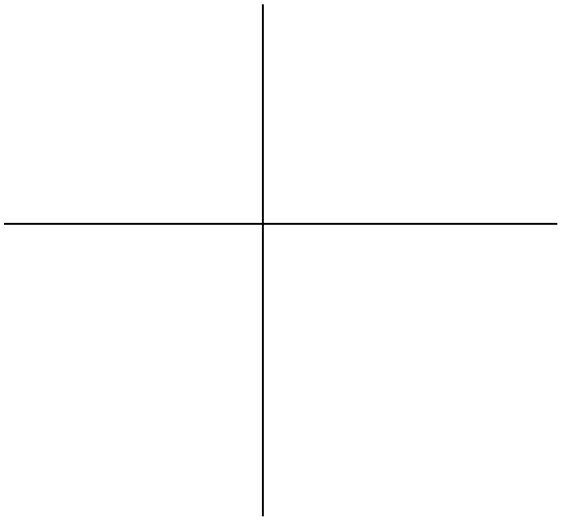
23. [12 points] Given the rational function: $f(x) = \frac{x-1}{2x+3}$. State the following and graph the function. Be sure to label all intercepts and asymptotes.

Domain:

Zeros: y-int:

HA: VA:

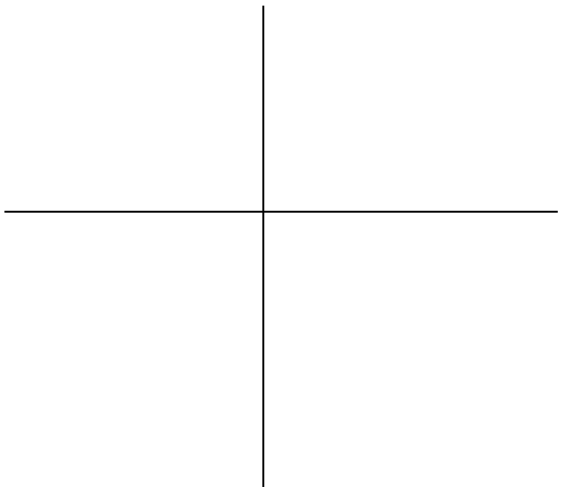
Additional Points:



24. [12 points] Given $f(x) = 8x^2(x-2)(x+1)^3$ find the following. Then, sketch the graph.
Be sure to label all intercepts.

- y-intercept:

Zero	Multiplicity	Tangent or Crosses Thru



- End Behavior:

Part III. There are 5 problems in this section. Choose any 3.

Indicate in the boxes the problems you want graded or the 1st three will be graded.

[10 points each]

❒ Grade

25. If a baseball is projected upward from ground level with an initial velocity of 64 feet per second, then its height is a function of time, given by: $s(t) = -16t^2 + 64t$.

a. What is the time at which the maximum height is reached?

b. What is the maximum height?

c. Find the times at which the ball is 28 feet from the ground? You must set up an equation and solve it for credit.

❒ Grade

26. Suppose that \$12,000 is invested in a savings account in which interest, k, is compounded continuously at 2.9% per year. The balance $P(t)$ after time t, in years, is $P(t) = Pe^{kt}$.

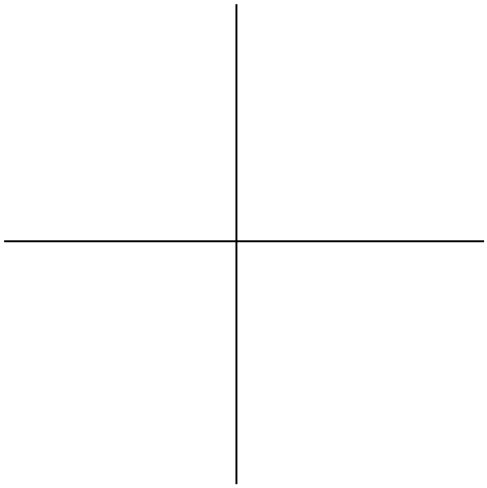
a. What is the exponential growth function in terms of t?

b. How long will it take for the investment to reach \$20,000? Leave your answer in exact form.

27. Graph the following functions, and state the asymptote and intercept of each.

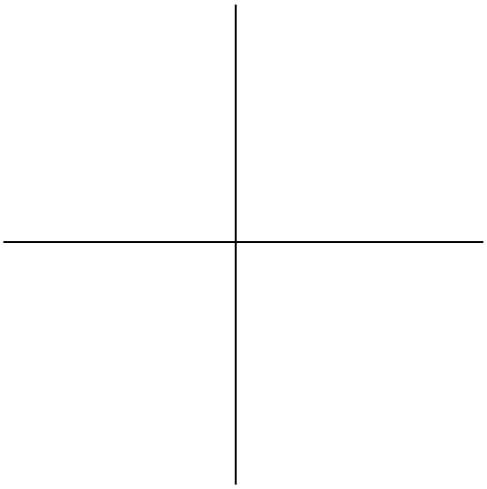
❒ Grade

a) $f(x) = e^x$



HA: _____ $y-int$:_____

b) $g(x) = \ln x$

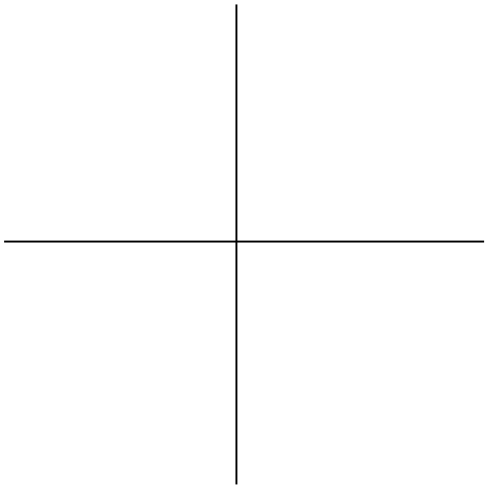


VA: _____ $x-int$:_____

28. Graph the following functions and state the coordinates of the indicated points.

❒ Grade

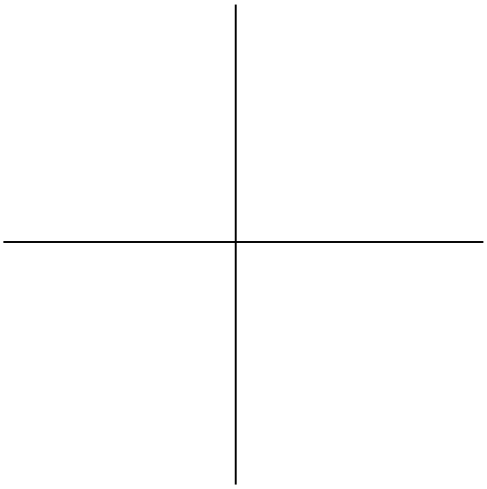
a) $f(x) = -3x^2 - 6x$



Vertex: _____

$x-int$: _____ & _____

b) $g(x) = -4x + 1$



$x-int$: _____ $y-int$:_____

29. Solve the system. State your answer as an ordered triple.

❒
Grade

$$\begin{cases} x + y + z = 4 \\ 2x + 4y + 2z = 10 \\ -x + 7y - 3z = 10 \end{cases}$$

Mark sure you checked the boxes beside the problems you want to be graded!