Name_____

NO CALCULATORS OR CELL PHONES ALLOWED.

Write a coherent, well organized, properly notated process
or you <u>will not</u> receive credit for your answer.
ALL work must be on this exam to be graded.
If you use scratch paper, you MUST transfer your work to this test.

Part I. Answer all problems in this section. Little partial credit will be given.
[6 points each]

1. Write the following inequalities in interval notation:

    a. $x \geq 0$ b. $-2 < x \leq 5$ c. $x \neq 10$

2. Let $f(x) = 3x - 2$ and $g(x) = x^2 + 2$. Find and simplify
    a. $(f - g)(1)$ b. $(f \circ g)(x)$

3. Simplify the following to $a + bi$ form.
    a. $(1 + 2i)(3 - i)$ b. $(2i)^3$

4. Evaluate:
    a. $\ln e^{2x-1} =$_____   b. $\log 1 =$_____   c. $\log_3 9 =$_____

5. Given the piecewise function:

$$f(x) = \begin{cases} 3x - 1, & for\ x > 2 \\ -1, & for\ x \leq 2 \end{cases}$$

Fill in the table:

x	$f(x)$
1	
2	
3	

6. Write an equation for a function that has a graph with the given characteristics:
   a. The shape of $y = x^2$ but upside-down and shifted right 7 units.

   b. The shape of $y = \sqrt{x}$ but reflected across the y-axis.

7. Solve for x:

   $|3x + 4| - 2 = 10$

8. Solve for x:

   $x^2 + 25 = 0$

9. Thara's T-shirt store sold 36 shirts one day. All blue T-shirts cost $12 each and all green shirts cost $18 each. Total receipts for the day were $522. How many of each color of shirt were sold?

Set up a system – but you do not need to solve!

10. Find a 3rd degree polynomial (in polynomial form) with zeros: 2 and $-5i$. Write the polynomial on the line below.
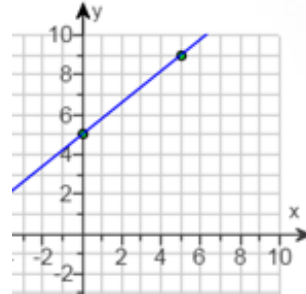
$f(x) =$ _____

Part II. Answer all problems in this section. [10 points each]
Some partial credit will be given based on work shown.

11. State the slope of the following lines:

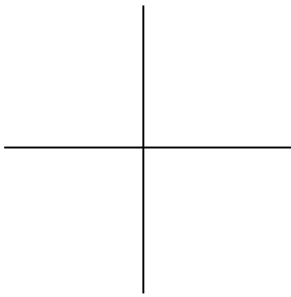   a. $x + 2y = 9$ b.
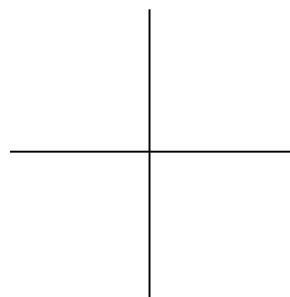
12. Graph the following lines:

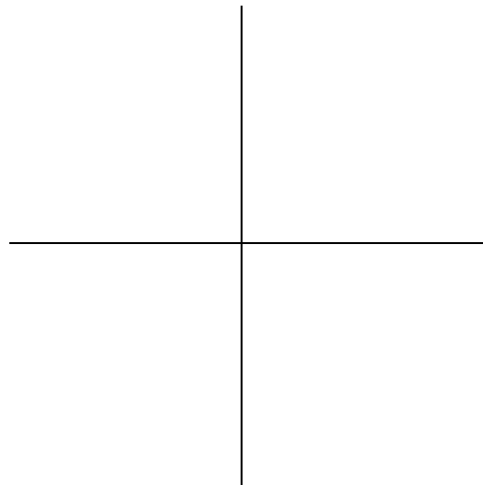   a. $y = 4$ b. $y = -2x - 1$

13. Given $f(x) = x^2 - 2x - 3$, find the following and sketch the graph.   Be sure to label all intercepts and the vertex.

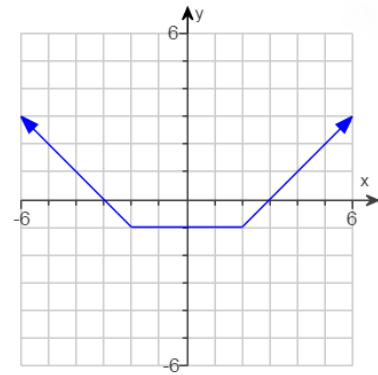   Vertex: (____ , ____)

    Zeros:

    y-intercept:_____

14. Given a function $f(x)$, find the inverse function $f^{-1}(x)$. Show all work algebraically and circle your answers.

a. $f(x) = \sqrt[3]{2x + 3}$

b. $f(x) = 5x^3 - 8$

15. Give the following intervals, in interval notation, based on the function $f(x)$ shown in the graph.

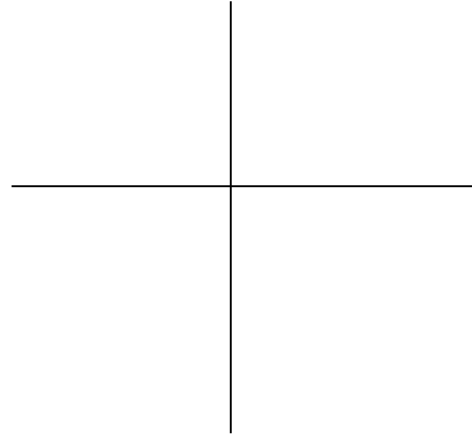| a. Domain of f:	b. Range of f:
c. f is increasing:	d. f is constant:
e. $f(x) \le 0$	

16. Solve for x.

a. $8^{x-1} = \frac{1}{2}$

b. $2e^{x+5} + 3 = 9$

17. Find the following and sketch the graph of $f(x) = \frac{-x}{x-4}$. Be sure to label all asymptotes and intercepts and use additional points as needed.

Zeros: y-int:

HA: VA:

18. Solve the following inequalities. State your answers in interval notation.

a. $x^2 + 3x - 28 < 0$

b. $-3 \leq \frac{x+5}{2} < 14$

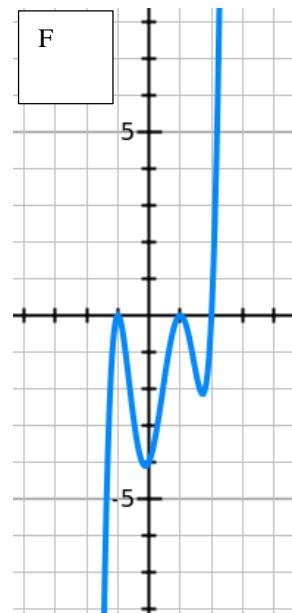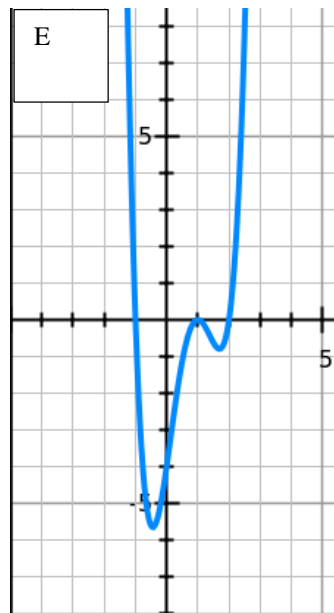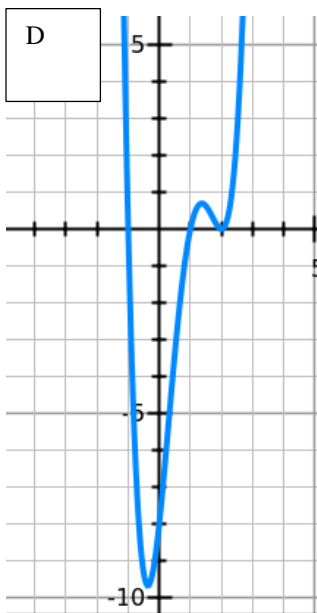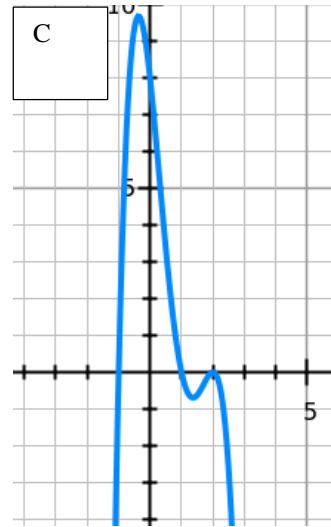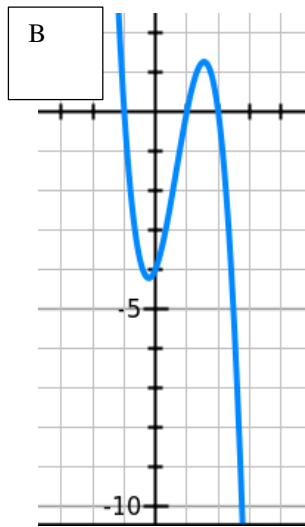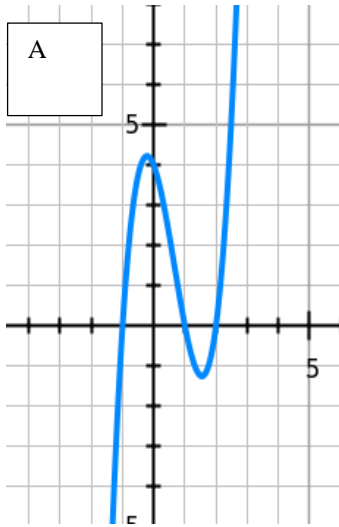19. Solve the following system. Write your answer as an ordered pair.

$$\begin{cases} 5x + y = -20 \\ 7x - 3y = -50 \end{cases}$$

20. Match the equation with the graph below. Put letter choice in answer blank.

$y = 2(x - 2)(x + 1)(x - 1)$ Answer: _____

$y = -2(x - 2)^2(x + 1)(x - 1)$ Answer: _____

$y = 2(x - 2)(x + 1)^2(x - 1)^2$ Answer: _____
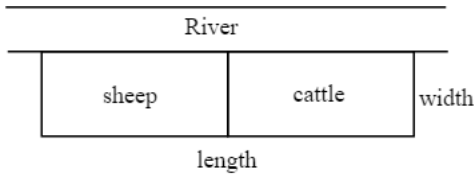
A

B

C

D

E

F

Part III. There are 6 problems in this section. Choose any 4.
Indicate in the boxes the problems you want graded. [10 points each]

21. A rancher needs to enclose a rectangular corral. The corral will be divided into 2 sections as shown below. Assume the river forms one side of the corral and 60 ft. of fencing is available.

☐
Grade

River

| sheep | cattle | width |

length

a) Write a function $A(x)$ for the total area of the corral.

b) What dimensions yield maximum area?

22. The sales S, of a product have declined in recent years. Assuming sales are decreasing according to the exponential decay model, $S(t) = 75e^{-0.02t}$ million. Determine the time it would take for the sales to reach 50 million. Leave your answer in exact form since no calculators are allowed.

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Grade

23. Given the polynomial $f(x) = x^3 + x^2 - 2$, find all zeros (real and complex).

☐
Grade

24. Solve for x. Be sure to check your solutions!

☐ $3 + \sqrt{3x + 1} = x$
Grade

25. Let $f(x) = -x^2 + x$. Set up and simplify the difference quotient: $\dfrac{f(x+h)-f(x)}{h}$

☐
Grade

26. The endpoints of the diameter of a circle are $(3, 0)$ and $(1, -4)$. Find the

    a) Center of the circle   b) Radius of the circle

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Grade