

***Part I. Problems in this section are mostly short answer and multiple choice. Little partial credit will be given. 5 points each.***

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1. Factor **completely**. Do not solve.

a)  $2x^2 + 20x + 18$

b)  $x^3 - 2x^2 + 3x - 6$

2. Find the quotient and remainder.

$(x^3 - 3x + 1) \div (x + 2)$

Quotient: \_\_\_\_\_

Remainder: \_\_\_\_\_

3. State the slope and y-intercept for the line  $5x + 2y = 6$

$m =$  \_\_\_\_\_

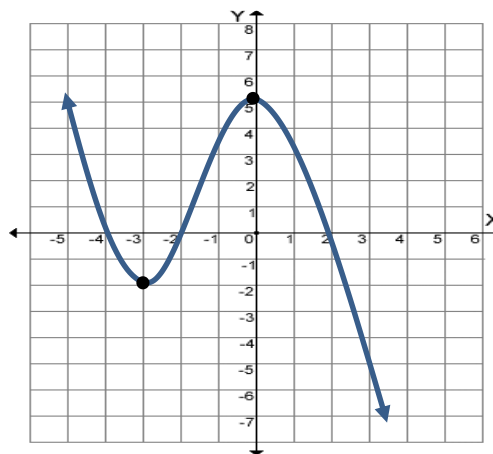
$y - \text{int} :$  \_\_\_\_\_

(write it as an ordered pair)

4. Given the graph of  $f(x)$ , state all  $x$  such that:

a)  $f(x)$  is increasing (use interval notation)

b)  $f(x) < 0$  (use interval notation)



5. Solve:  $-3 \leq \frac{2+x}{4} < 6$ . Express your answer in interval notation.

6. Find the domain of the function  $g(x) = \sqrt{x+3}$ . Circle the correct answer.

- a)  $(-\infty, \infty)$
- b)  $(-3, \infty)$
- c)  $(-\infty, -3)$
- d)  $[-3, \infty)$
- e)  $(-\infty, -3]$

7. Solve for  $x$ . Show all work and circle your final answer.

a)  $x^2 - 5x = 6$

b)  $A = \frac{1}{4}xy$

8. Let  $f(x) = 5x - 3$  and  $g(x) = x^2 + 1$ . Find and simplify.

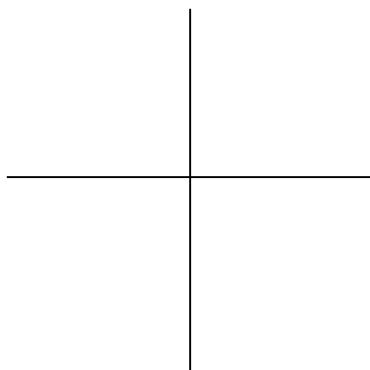
a)  $(f \circ g)(2)$

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

9. Solve ALGEBRICALLY. Show all work.  $|2x - 3| + 4 = 11$

10. Graph each function. Dash in asymptotes where needed. Label all intercepts and asymptotes!

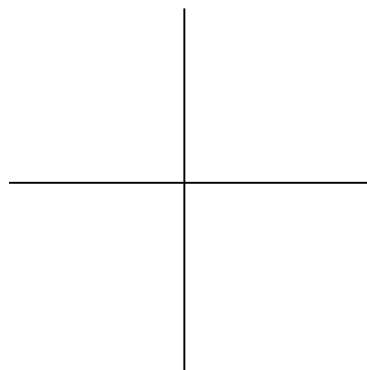
$$f(x) = e^x + 3$$



Intercept in  $(x,y)$  form: \_\_\_\_\_

Equation of asymptote: \_\_\_\_\_

$$g(x) = \ln(x+1)$$



Intercept in  $(x,y)$  form: \_\_\_\_\_

Equation of asymptote: \_\_\_\_\_

11. Find the product. Express in  $a + bi$  form.  $(4 + 6i)(1 - 3i)$

12. Find the slope of linear function  $f$  such that  $f(3) = 2$  and  $f(0) = -1$ .

$m =$  \_\_\_\_\_

13. Write a polynomial of degree 3 that has zeros: 2 and  $4i$ . Write final answer in polynomial form (multiplied out).

$f(x) =$  \_\_\_\_\_

14. Given the point  $(-2, 3)$ , find a point that is symmetric to the given point:

a) with respect to the y-axis.

b) with respect to the origin.

***Part II. There are 9 problems in this section. Show all work. 10 points each.***

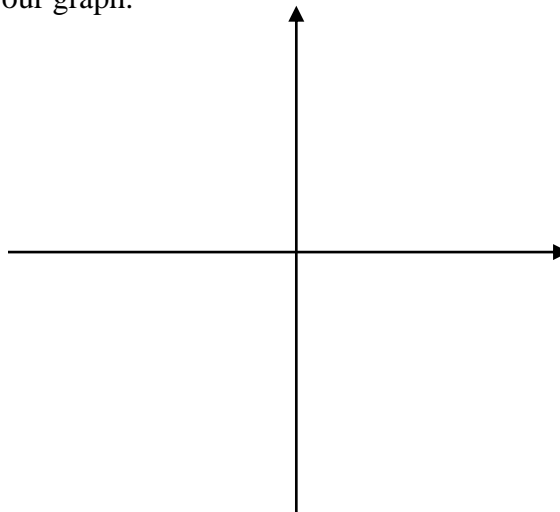
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15. A stone is thrown directly upward. Its height after  $t$  seconds is given by the function  $h(t) = -3t^2 + 6t + 4$ . The height of the stone is measured in feet. Show your work algebraically and include units on your answers.

- a) What is the initial height of the stone?
  
  
  
  
  
  
  
  
  
  
- b) How long does it take for the stone to reach its maximum height?
  
  
  
  
  
  
  
  
  
  
- c) What is the maximum height the stone reaches?

16. Find all asymptotes,  $x$ -intercepts (zeros), and  $y$ -intercepts for the graph  $f(x) = \frac{4x-6}{x-2}$ .

- a) The equation of the vertical asymptote(s) is/are  $x =$  \_\_\_\_\_.
- b) The equation of the horizontal asymptote(s) is/are  $y =$  \_\_\_\_\_.
- c) The  $x$ -intercept (or zero) is at the point \_\_\_\_\_.
- d) The  $y$ -intercept is at the point \_\_\_\_\_.
- e) Sketch the graph of  $f(x)$ . Label all intercepts, asymptotes, and any additional points you found to help improve your graph.



17. Find a formula for the inverse given  $f(x) = \frac{x+1}{3x-2}$ .

$$f^{-1}(x) = \underline{\hspace{10cm}}$$

18. Solve algebraically for  $x$ .

a)  $4^{2x} = 8^{3x-1}$

b)  $\ln(5x - 9) = 0$

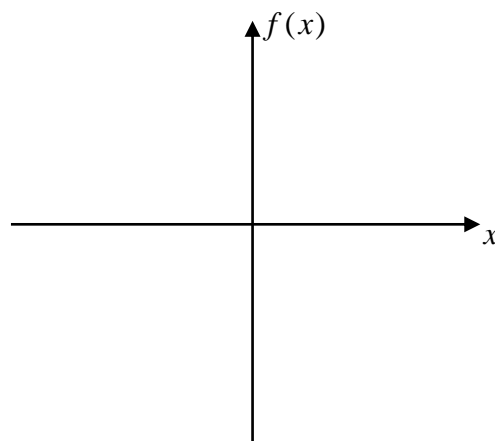
19. Suppose \$600 is invested in a savings account in which interest is compounded continuously at 2% per year. The amount of money in the account  $t$  years later is given by the equation:  $A = 600e^{0.02t}$ . Find the amount of time it would take the amount to reach \$2000. Leave your answer in exact form since no calculators are allowed.

20. Given the function  $f(x) = x^2(x - 2)(x + 3)^2$ ,

a) Find the y-intercept.

b) Find all zeros and state their multiplicities.

zero	multiplicity



c) Is  $f(x)$  tangent to the  $x$ -axis?  
If so, where?

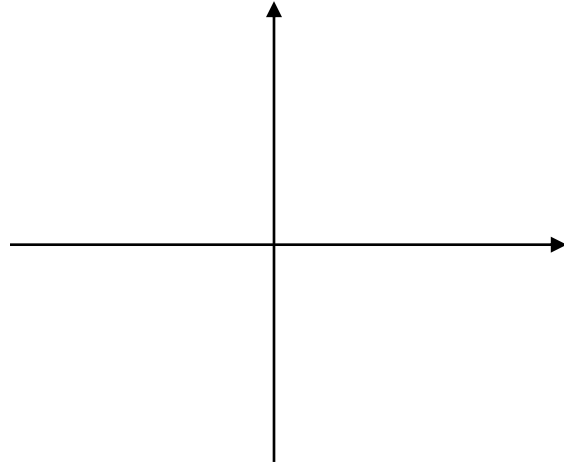
d) Draw ending behavior.

e) Sketch graph. Label all intercepts.

21. Solve algebraically:  $\sqrt{6x+7} = x+2$ . Check all solutions.

22. Given the function  $f(x) = x^2 + 6x + 5$

- a) State the y-intercept.
- b) State the zeros of the function.
- c) The vertex is ( \_\_\_\_\_ , \_\_\_\_\_).
- d) State the range of  $f$ .
- e) Graph. Label intercepts and vertex.



23. Given the polynomial  $g(x) = x^3 - x^2 + x - 6$

- a) State all possible rational zeros.
- b) Find all zeros (real and complex.)

Answer: \_\_\_\_\_

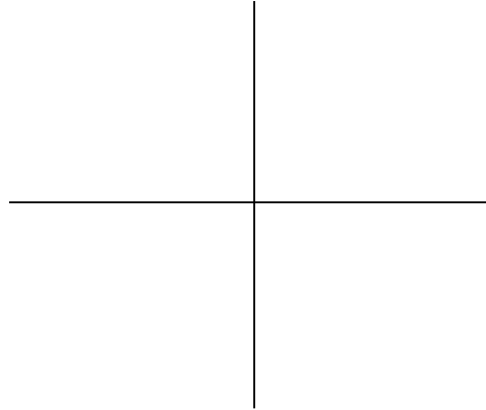


**Part III. There are 6 problems in this section. Choose any 4. Indicate in the boxes the problems you want graded. 10 points each. If you do not indicate which 4, the first 4 will be graded. No Extra Credit!**

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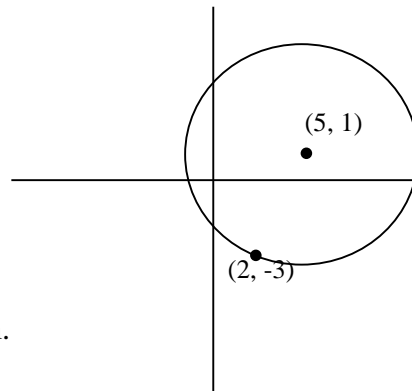
24. Graph the following function.  
Grade

$$f(x) = \begin{cases} -2x + 1, & x < 0 \\ -3 & , x \geq 0 \end{cases}$$



25. The graph to the right is a circle with center (5,1).  
Grade

a) Find the length of the radius.



b) State the equation of the circle in standard form.

26. Given  $f(x) = 2x^2 + 4x$ , find and simplify  $\frac{f(x+h) - f(x)}{h}$ .  
Grade

□  
Grade

27. Solve algebraically for  $x$ .  $\log_2 x + \log_2(x - 2) = 3$

□  
Grade

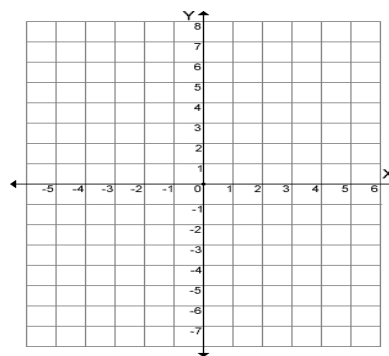
28. Solve  $\frac{x+2}{x-3} \geq 0$ . Express in interval form. To receive full credit you must show work that supports your answer.

□  
Grade

29. Consider the following system: 
$$\begin{cases} 2x - 3y = -6 \\ x + y = 2 \end{cases}$$

a) Solve algebraically  
Show all your work.

b) Solve graphically and explain how you obtained your answer by looking at the graph.



Answer: \_\_\_\_\_