

INSTRUCTIONS: You must show enough work to justify your answer on **ALL** problems. Correct answers with no work (or inconsistent work) shown **will not** receive full credit. **All answers are to be exact; no decimal approximations.** You are **NOT** allowed to use any electronic device for this exam.

1. Find the domain of the function $f(x) = \sqrt{4x + 9}$. Write your answer using interval notation. (4 pts.)

Answer _____

2. Write the equation of the circle in standard form given the following information. **Put a box around your answer.**

a. Center: $(-5, 0)$; Radius: $\sqrt{3}$ (4 pts.)

b. The endpoints of a diameter are $(-2, -5)$ and $(6, -11)$. (8 pts.)

3. Find the center and radius of the circle whose equation is given by $x^2 + y^2 - 6x + 14y + 30 = 0$. (8 pts.)

Center _____

Radius _____

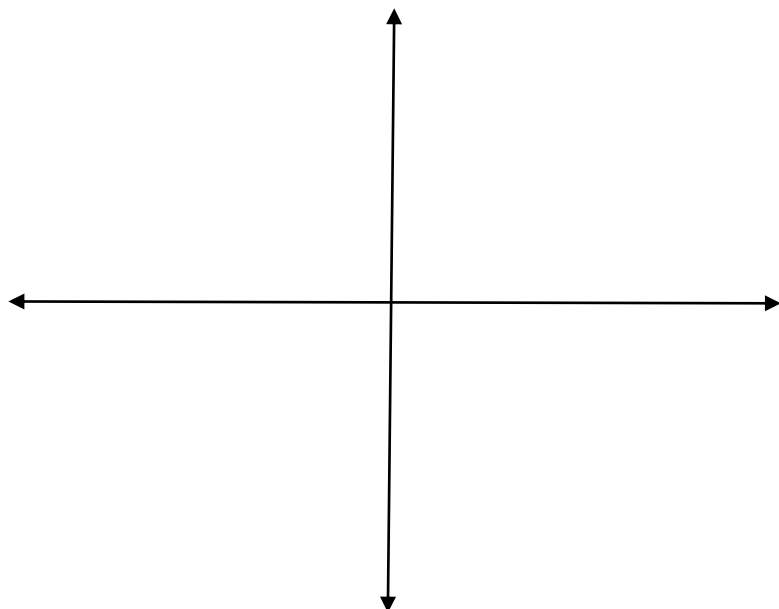
4. If $g(x) = 2x^2 - 7x$, then find the average rate of change of the function g on the interval $[5, 5 + h]$, where $h > 0$. (8 pts.)

Answer _____

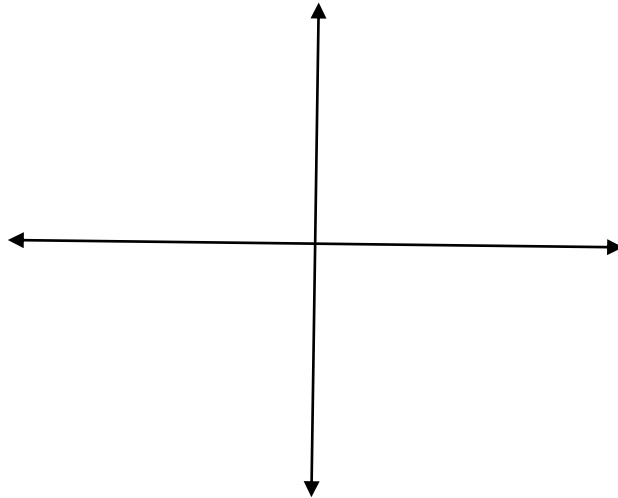
5. If $f(x) = 8x - 11$ and $g(x) = 4 - x^2$, then find $(f \circ g)(x)$. (5 pts.)

Answer _____

6. Sketch the graph of $h(x) = \frac{6}{3x + 7}$. (5 pts.)



7. Sketch the graph of the function $g(x) = 4|x - 6| - 2$ and identify the following.
- horizontal shift _____ (2 pts.)
 - vertical shift _____ (2 pts.)
 - range of the function _____ (3 pts.)
 - interval(s) on which the function is increasing _____ (2 pts.)
 - interval(s) on which the function is decreasing _____ (2 pts.)
 - value of relative (local) maximum(s) and location(s) _____ (2 pts.)
 - value of relative (local) minimum(s) and location(s) _____ (2 pts.)
 - x -intercept(s) _____ (5 pts.)
 - sketch: (3 pts.)



8. If $h(x) = 2x^4 + 6x^2 - 9x + 12$, then use the Remainder Theorem to find $h(-4)$. (5 pts.)

Answer _____

9. Identify the possible rational zeros (roots) of the polynomial $f(x) = 3x^4 + 2x^3 - 25x^2 - 28x + 12$. Then find the zeros (roots). Write a factorization for $f(x) = 3x^4 + 2x^3 - 25x^2 - 28x + 12$.

(16 pts.)

Possible rational zeros (roots):

Zeros (Roots) _____

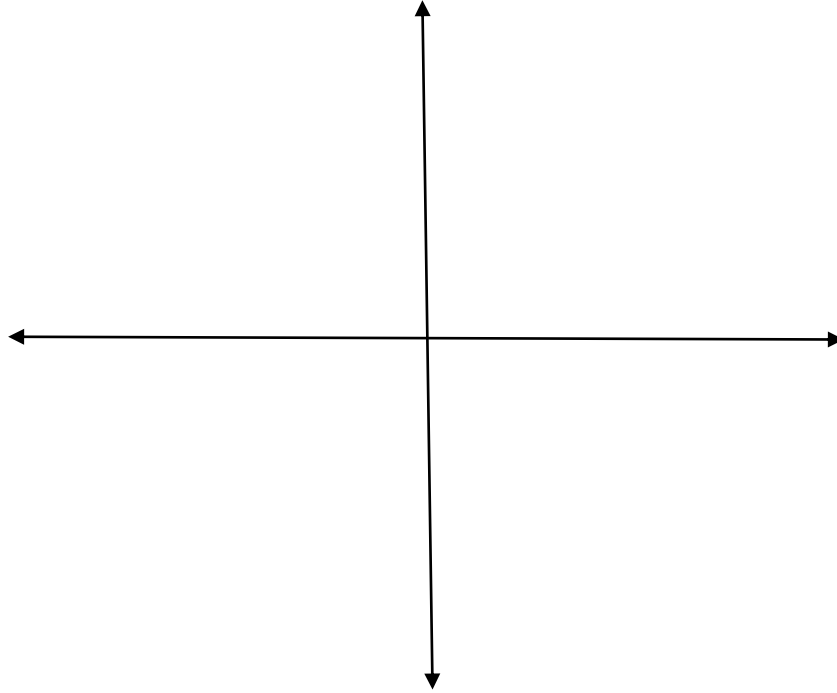
Factorization:

10. Solve $\frac{5 - x}{7x - 12} \geq 0$. Write your answer using interval notation. (8 pts.)

Answer _____

11. Given the rational function $f(x) = \frac{2x + 1}{x^2 - 2x - 15}$, then find the following.

- a. vertical asymptote(s) _____ (3 pts.)
- b. horizontal asymptote(s) _____ (3 pts.)
- c. if the function has a horizontal asymptote, determine if the graph crosses the asymptote; if the graph crosses the asymptote, give the location _____ (3 pts.)
- d. sketch the graph of the function (6 pts.)



12. Find the zeros (roots) and their multiplicities of $g(x) = 2x^2(8 - x)^3(6x + 5)^4$. Determine what implication the multiplicity of the zero (root) has on the graph of the polynomial. Determine the sign of the infinity that the polynomial values approaches as x approaches positive infinity and negative infinity. (8 pts.)

Zero (Root)	Multiplicity	Implication on the Graph
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As $x \rightarrow \infty$, $g(x) \rightarrow$ _____

As $x \rightarrow -\infty$, $g(x) \rightarrow$ _____