Name _____

Rocket Number _____

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 $f(x) = \sqrt{9x - 16}$. 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: $(-8, 0)$; Radius: $\sqrt{11}$ (4 pts.)

   b. The center is $(2, -7)$ and the point $(-4, 3)$ is a point on the circle. (6 pts.)

3. Write the circle $x^2 + y^2 + 20x - 6y + 49 = 0$ in standard form and identify the center and radius of the circle. (8 pts.)

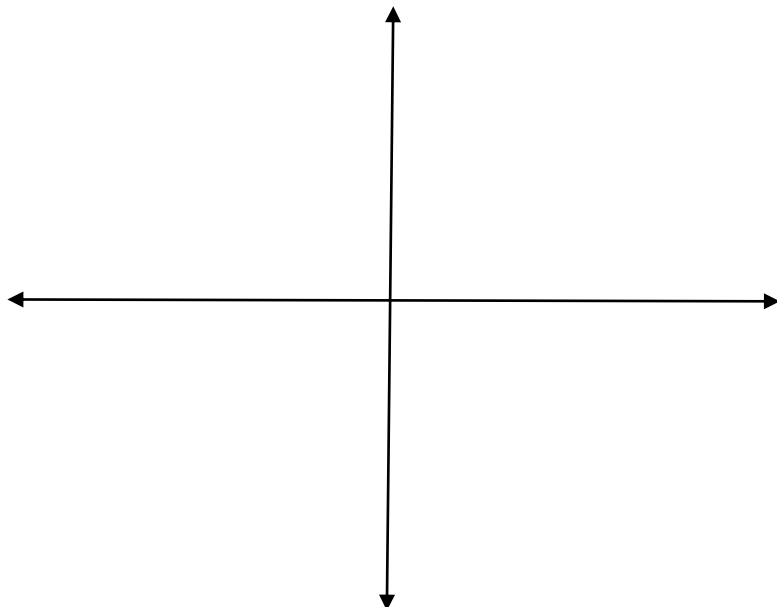   Center _____   Radius _____

4. If $g(x) = 4x^2 - 9x$, then find the average rate of change of the function g on the interval $[2, 2 + h]$, where $h > 0$. (8 pts.)
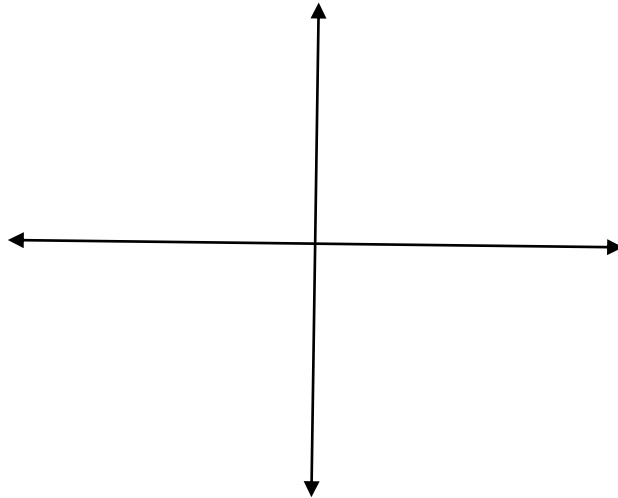
Answer _____

5. If $f(x) = x + 4$ and $g(x) = 3x^2 + 2$, then find $(g \circ f)(x)$. (5 pts.)

Answer _____

6. Sketch the graph of $h(x) = \dfrac{1}{4x + 8}$. (5 pts.)

7.   Sketch the graph of the function $g(x) = -|x - 3| + 8$ and identify the following.

    a.   horizontal shift _____ (2 pts.)

    b.   vertical shift _____ (2 pts.)

    c.   range of the function _____ (3 pts.)

    d.   interval(s) on which the function is increasing _____ (2 pts.)

    e.   interval(s) on which the function is decreasing _____ (2 pts.)

    f.   value of relative (local) maximum(s) and location(s) _____ (2 pts.)

    g.   value of relative (local) minimum(s) and location(s) _____ (2 pts.)

    h. x-intercept(s) _____ (5 pts.)

    i.   sketch: (3 pts.)

8.   If $g(x) = 3x^4 + 2x^2 - 12x - 38$, then use the Remainder Theorem to find $g(-4)$. (5 pts.)

    Answer _____

9.   Identify the possible rational zeros (roots) of the polynomial $h(x) = x^4 - 4x^3 - 3x^2 + 14x - 8$.
      Then find the zeros (roots), their multiplicities, and determine what implication the multiplicity of the

zero (root) has on the graph of the polynomial. Write a factorization for $h(x)$. Determine the sign of the infinity that the polynomial values approaches as x approaches positive infinity and negative infinity. Then sketch a graph of the polynomial. (20 pts.)
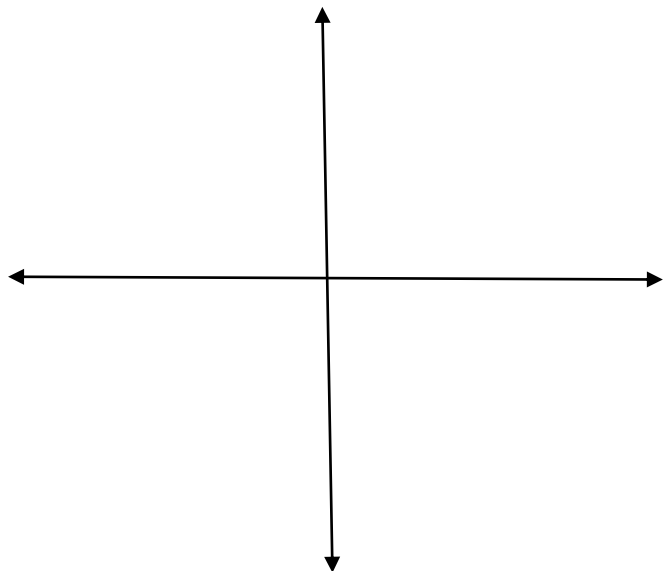
Possible rational zeros (roots):

Zero (Root)   Multiplicity   Implication on the Graph

Factorization for $h(x)$:

As $x \to \infty$, $h(x) \to$ _____

As $x \to -\infty$, $h(x) \to$ _____

10.   Solve $\dfrac{4 - x}{3x + 2} \leq 0$. Write your answer using interval notation. (8 pts.)

Answer _____

11.   Find the zeros (roots) and their multiplicities of $g(x) = (5x + 3)^2 (6 - x)^3$. Determine what
        implication the multiplicity of the zero (root) has on the graph of the polynomial.   (6 pts.)

        Zero (Root)   Multiplicity   Implication on the Graph