

**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  $f(x) = \sqrt{5 - 3x}$ . 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:  $(0, -6)$ ; Radius:  $\sqrt{7}$  (4 pts.)

b. The center is  $(-2, 5)$  and the point  $(3, -4)$  is a point on the circle. (6 pts.)

3. Find the center and radius of the circle whose equation is given by  $x^2 + y^2 + 16x - 8y - 5 = 0$ . (8 pts.)

Center \_\_\_\_\_

Radius \_\_\_\_\_

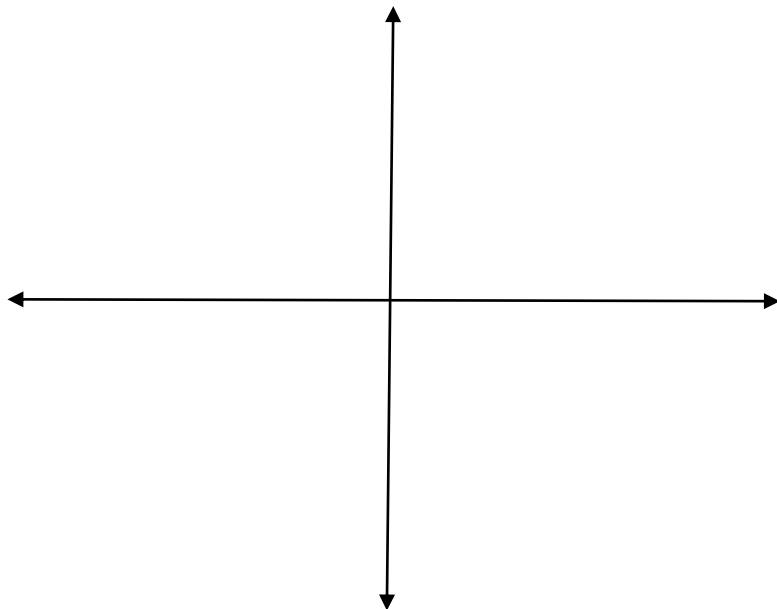
4. If  $g(x) = 4x^2 - 7x$ , then find the average rate of change of the function  $g$  on the interval  $[3, 3 + h]$ , where  $h > 0$ . (8 pts.)

Answer \_\_\_\_\_

5. If  $f(x) = 2x - 5$  and  $g(x) = 9 - 4x$ , then find  $(g \circ f)(x)$ . (5 pts.)

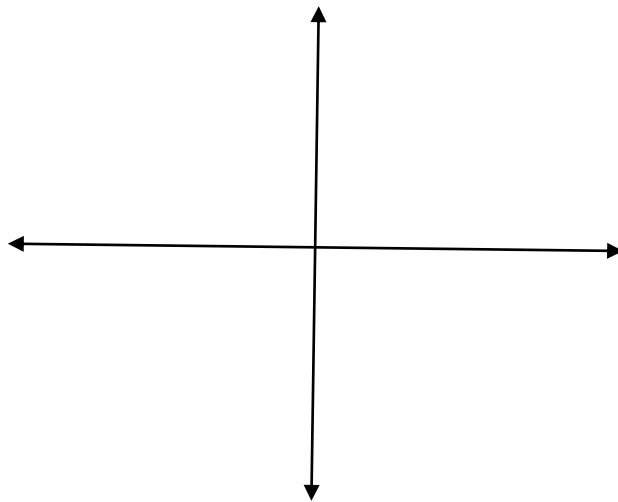
Answer \_\_\_\_\_

6. Sketch the graph of  $h(x) = \sqrt[3]{7x - 12}$ . (5 pts.)



7. Sketch the graph of the function  $f(x) = -3(x + 2)^2 + 5$  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  $g(x) = 2x^4 + 3x^2 - 20x - 35$ , then use the Remainder Theorem to find  $g(6)$ . (5 pts.)

Answer \_\_\_\_\_

9. Identify the possible rational zeros (roots) of the polynomial  $h(x) = 2x^3 - 5x^2 - 9x + 18$ . Then find the zeros (roots). (12 pts.)

Possible rational zeros (roots):

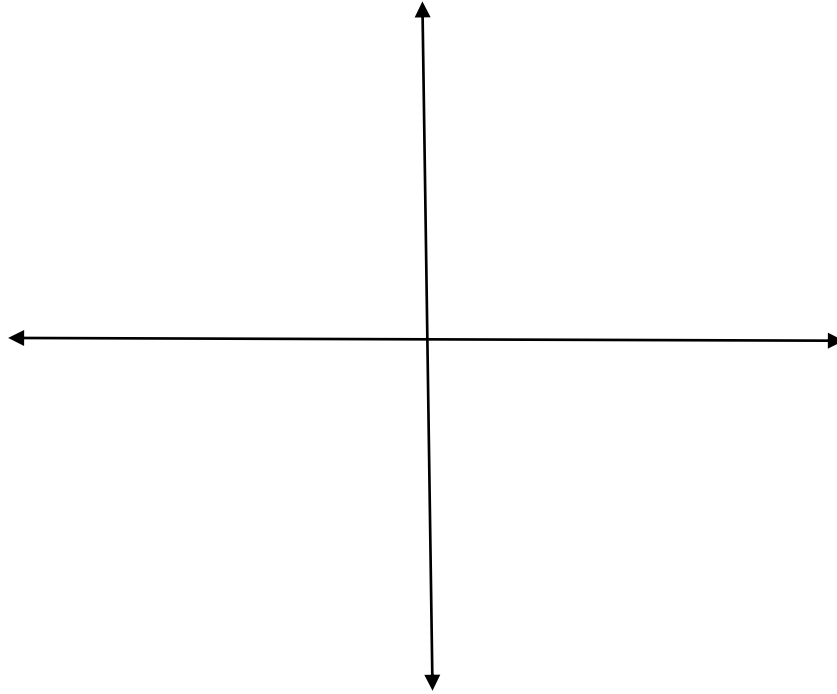
Zeros (Roots) \_\_\_\_\_

10. Solve  $\frac{x - 8}{3x - 16} \leq 0$ . Write your answer using interval notation. (8 pts.)

Answer \_\_\_\_\_

11. Given the rational function  $f(x) = \frac{3 - 2x}{x^2 + x - 12}$ , 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  $g(x) = (9x + 7)(2 - x)^3(x + 6)^4$ . 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  $x \rightarrow -\infty$ ,  $g(x) \rightarrow$  \_\_\_\_\_