

1. 10 pts. Find the exact distance between points  $(-4, -1)$  and  $(2, -3)$ .

2. 15 pts. Complete the square and write the equation

$$x^2 + y^2 - 4x + 2y - 4 = 0$$

in the standard form for a circle. What is the center and radius of the circle?

3. 10 pts. Find the vertex of the parabola given by  $f(x) = 2x^2 - 8x - 3$ . In interval notation, what is the domain and range of the function?

4. 5 pts. each If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height  $h$  after  $t$  seconds is given by the function

$$h(t) = -16t^2 + 128t.$$

- (a) How long will it take the rocket to reach its maximum height?
- (b) What is the maximum height?
- (c) When will the rocket return to the ground?

5. 10 pts. Divide using long division:  $(x^4 + 2x^3 - 4x^2 - 5x - 6) \div (x^2 + x - 2)$ .

6. 15 pts. Consider the equation

$$x^4 - 2x^2 - 16x - 15 = 0.$$

List all the possible rational roots. Use synthetic division to test the possible rational roots and find actual roots. Then find *all* solutions to the equation, real or complex.

7. 15 pts. Use the 7-step procedure used in homework to sketch a graph of the rational function

$$R(x) = \frac{x^2 + x - 6}{x - 3}.$$

The steps are: (1) Symmetry; (2)  $y$ -intercept; (3)  $x$ -intercepts; (4) vertical asymptotes; (5) horizontal/slant asymptote; (6) plot additional points as needed; (7) graph.

8. 10 pts. each Solve each inequality, showing use of test values and the Intermediate Value Theorem. Put answers in interval notation.

(a)  $(x + 1)(x - 2)(x + 3) > 0$

(b)  $\frac{x}{x - 6} \leq 1$