Name: _____

**College Algebra: Review (Test 3)**

1. Fill in the boxes to describe the long-term behavior of the following polynomial.

$$p(x) = 7x^6 + 13x^2 - x + 1$$

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- As $x \to \infty$, $p(x) \to$ ☐
- As $x \to -\infty$, $p(x) \to$ ☐

2. Construct a polynomial having roots at $-1$, 2, and $-1/2$.

3. The polynomial

$$p(x) = x^5 - 3x^4 - 11x^3 + 27x^2 + 10x - 24$$

has roots at $1; 4; -1; 2$. Completely factor $p(x)$ as a product of linear factors.

4. Find the list of candidate roots of the polynomial

$$p(x) = 5x^3 + 3x^2 + 4x + 9$$

given by the Rational Root Theorem. **Do not factor.**

5. Using polynomial long division, find the quotient and remainder when

$$a(x) = x^5 - 4x^4 + 4x^3 + 2x^2 - 5x + 2$$

is divided by

$$b(x) = x^3 - 2x^2 - x + 2.$$

6. Find the long-term behavior asymptote of the following rational function.

$$f(x) = \frac{x^3 + 3x^2 - 4x + 7}{x^2 + x + 1}$$

7. Find the domain of the following rational function.

$$f(x) = \frac{1337x^{42} - x^{27} + 1}{(x+1)^3(x-2)(x+4)^5}$$

8. Find the multiplicity of $-1$ as a root of the following polynomial.

$$p(x) = x^3 - x^2 - x + 1$$