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

$$p(x) = -4x^5 + 10x^2 + x - 1$$

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- As $x \to \infty$, $p(x) \to \boxed{}$

- As $x \to -\infty$, $p(x) \to \boxed{}$

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

$$a(x) = x^5 - 4x^4 + 14x^2 - 17x + 6$$

is divided by

$$b(x) = x^3 - 2x^2 - 5x + 6.$$

3. Use synthetic division to find the quotient and remainder when

$$a(x) = x^5 - 2x^4 - 6x^3 + 8x^2 + 5x - 6$$

is divided by $b(x) = x - 1$.

4. The polynomial
$$p(x) = x^5 - x^4 - 19x^3 + x^2 + 90x + 72$$
has roots at $-2; 4; -1; 3$. Completely factor $p(x)$ as a product of linear factors.

5. The polynomial
$$p(x) = x^5 - 7x^4 + 19x^3 - 25x^2 + 16x - 4$$
has roots at 1 and 2. Find the multiplicity of these roots.

6. Construct a polynomial of degree 3 which has roots at 1, -1, and 2.