1. (10pts) Solve for all x’s that satisfy the inequalities:
   (a) \((x + 1)(x + 2) < x(x + 1)\)
   (b) \(|2x - 5| > 10\)

2. (10pts) Solve the equations.
   (a) \(\frac{5x}{x - 4} - \frac{20}{x} = \frac{80}{x^2 - 4x}\)
   (b) \(5 + \sqrt{x + 7} = x\)

3. (4pts) Given the polynomial function \(f(x) = 2.4x^4 + 5x^2 - 0.2 + \frac{7}{8}x^5\), answer the following questions:
The degree is _____; the leading term is _____;
the leading coefficient is _____; the constant term is _____; 

4. (8pts) Given the following functions, describe the behavior of the graphs as \(x \to -\infty\) and \(x \to \infty\) by placing one of the following graphs in the spaces provided for each function.

   a. \(f(x) = -2003x^{1000} + 1000x^{999} + 3333x - 99999\) has the behavior ________

   b. \(f(x) = 10000x^{9999} - 99999x^{1000} + 999999\) has the behavior ________

   c. \(f(x) = 99999x^{1000} - 100000x^{999} - 99999\) has the behavior ________

   d. \(f(x) = -20000x^{1999} - 19999x^{1000} + 99999\) has the behavior ________
5. (8pts) Use long division to find the quotient $Q(x)$ and remainder $R(x)$ for $f(x) = 3x^5 - 3x^4 + 4x^3 - 3x + 5$ divided by $d(x) = x^2 - x + 1$ and write the polynomial $f(x)$ in the form $f(x) = d(x) \cdot Q(x) + R(x)$.

$Q(x) =$ 

$R(x) =$ 

$f(x) =$ 

6. (10pts) Use synthetic division to compute the value $f(c)$ and write $f(x) = (x - c) \cdot Q(x) + f(c)$ for $f(x) = x^3 - 6x^2 + 11x - 6$.

(a). Find $f(1)$ and the quotient $Q(x)$.

(b). Find $f(-2)$ and the quotient $Q(x)$.

7. (10pts) Find all zeros (including complex zeros) and their multiplicities for the polynomial functions.

(a). $f(x) = -3x^3(x + 4)^2(x^2 - 1)$

(b). $f(x) = x^4 - 4x^2 + 3$

8. (5pts) Find a polynomial $f(x)$ of degree 4 with $-2$ as a zero of multiplicity 2 and with 3 and $-1$ each as a zero of multiplicity 1.

9. (5pts) Find a polynomial function of lowest degree with rational coefficients and zeros $3 - \sqrt{2}, 1 - 2i$. (Make sure your answer should have rational coefficients only.)
10. (10pts) The polynomial function \( f(x) = x^3 - 6x^2 + 13x - 20 \) has 4 as a zero. Find all other zeros (including complex zeros) by first factoring into the form \( f(x) = (x - 4)Q(x) \).

11. (10pts) Find all zeros of the polynomial function \( f(x) = 3x^3 + 41x^2 + 8x - 4 \) by doing the following:
   (a). List all possible rational zeros.
   (b). Test among the list in (a) to see which one is a zero.
   (c). Factor the polynomial into linear factors and find all zeros and their multiplicities.

12. (10pts) For the rational function \( f(x) = \frac{x^2 - 9}{x + 2} \), do the following:
   (a). Find all asymptotes (vertical, horizontal/slanted).
   (b). Find all \( x \)-intercepts and \( y \)-intercepts.
   (c). Sketch the graph of the function using the facts in (a) and (b).