MAT 121 Online 80 Points Fall, 2010
Test 3, Chapter 3 Name______________________________

1. State whether the function is a polynomial or not. If not, give a reason why.

a. (5 pts) $f(x) = \sqrt{x^2 - 3} + 2x$

b. (5 pts) $f(x) = x^4 - 3x^2 + \frac{2}{3}$

2. Give a (quick) rough sketch of the following:

a. (5 pts) $f(x) = (x+6)^3$

b. (5 pts) $f(x) = \frac{1}{(x-6)^2}$

3. In each of the following, form a polynomial with real coefficients that has the given zeros and degree. Please do not expand the polynomial.

a. (5 pts) Zeros: - 4, multiplicity 2; 2, multiplicity 3. Degree 5.

b. (5 pts) Zeros: 2, multiplicity 1; 5, multiplicity 2; 7 - 8i, multiplicity 1.
Degree 5.

4. (5 pts) Expand $(x-(5+3i))(x-(5-3i))$

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

a. (5 pts) List each real zero and its multiplicity. Determine whether the graph of $f(x)$ touches or crosses the x-axis at each x-intercept.

b. **Bonus** (5 pts) Determine the behavior of $f(x)$ near each x-intercept. In other words, determine the function that f resembles at each x-intercept.

c. (5 pts) Determine the power function that $f(x)$ resembles for large $|x|$. This is the End Behavior part of the question.

d. (5 pts) Use the information you reported to obtain a rough graph of $f(x)$. Show all intercepts, including the y-intercept.

6. Solve the inequalities.

a. (5 pts) $(x-1)^2(x+3)(x-4)^3 \geq 0$ (See previous work! If you know how to graph polynomials in factored form, this one is virtually a freebie!)

b. (5 pts) $\dfrac{(x-1)^2(x-4)^3}{(x+3)} \geq 0$ (See previous work!)

7. (5 pts) Divide $f(x) = 2x^4 - 3x^3 + x - 3$ by $f(x) = x^2 - 1$

8. (5 pts) Use Descarte's Rule of Signs and the Rational Zeros Theorem to find all the real zeros of $f(x) = x^4 - 11x^3 + 42x^2 - 14x - 68$. Use the *real* zeros to factor f over the real numbers. This is *likely* to involve an irreducible quadratic factor.

9. (5 pts) Based on your work in #8, above, find *all* the (real *and* nonreal) zeros of $f(x) = x^4 - 11x^3 + 42x^2 - 14x - 68$. Use *all* the zeros to write $f(x)$ as the product of *linear* factors.

Bonus (5 pts) What is the domain of $\sqrt{\frac{(x-1)^2(x-4)^3}{(x+3)}}$?

(Hint: See your previous work on this test.)

10. (5 pts) Divide $f(x) = 2x^4 - 3x^3 + x - 3$ by $f(x) = x^2 - 1$

11. (5 pts) Graph the function $R(x)=\dfrac{3x^3-6x^2-27x+54}{x^3-x^2-5x-3}=\dfrac{3(x-2)\left(x^2-9\right)}{(x+1)^2(x-3)}$. Key features are asymptotes, holes (if any) and intercepts. I was kind enough to factor it for you.