MAT 121-G81 Test 3 – Fall, 2013 Name_________________
70 Points Covers Chapter 3 NO GRAPHING CALCULATORS!!!

1. (10 pts) Form a polynomial of *minimial degree* in *factored form* that has real coefficients (after expanding) and will have the given zeros. Do *not* expand your polynomial. Leave it factored! If you run out of room, you're doing it wrong!

Zeros: $x = 4$, multiplicity 3; $x = 3 - 7i$, multiplicity 1; $x = -5$, multiplicity 2.

2. (10 pts) Use synthetic division to find $P(-2)$ if $P(x) = 2x^5 - 7x^3 + 11x^2 - 5x - 5$.

3. (5 pts) Represent the work you just did on the previous problem by writing $P(x)$ in the form $Dividend = Divisor \bullet Quotient + Remainder$.

4. Suppose $f(x) = (x+2)(x-1)^3(x-3) = x^5 - 4x^4 + 14x^2 - 17x + 6$. I'm showing you both factored and expanded form to help you answer the following:
   a. (10 pts) Provide a rough sketch of *f*, using its zeros, their respective multiplicities and the end behavior of *f*. Include *x*- and *y*-intercepts. Your graph should be smooth. Un-exaggerate the vertical for a better quality graph.

   b. Solve the inequalities (You've done the work. Now, INTERPRET.):
      i) (5 pts) $(x+2)(x-1)^3(x-3) \geq 0$
      ii) (5 pts) $\dfrac{(x+2)(x-3)}{(x-1)^3} \geq 0$

5. (10 pts) Find the *real* zeros of $f(x) = x^5 - x^4 - 5x^3 + 17x^2 + 16x - 28$. Then factor *f* over the set of **real numbers**. This should involve an irreducible quadratic factor.

6. (5 pts) Find the remaining (nonreal) zeros of *f* and factor *f* over the set of **complex numbers**.

7. (10 pts) Use long division to find the equation of the oblique asymptote of $R(x) = \dfrac{3x^3 + 3x^2 - 4}{x^2 - 4}$

**Bonus:** (5 pts) Same instructions as #1, only I want your factored polynomial to have *rational* coefficients after expansion:

Zeros: $x = 2 + \sqrt{3}$, multiplicity 1; $x = 2 + 3i$, multiplicity 2; $x = -5$, multiplicity 17.

**Bonus:** (5 pts) What is the domain of $\psi(x) = \sqrt{\dfrac{(x+2)(x-3)}{(x-1)^3}}$ ?