MAT 121 Online 80 Points Spring, 2011

Test 3, Chapter 3 Name______________________________

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

a. (5 pts) $f(x) = -2(x-5)^4$

b. (5 pts) $f(x) = \dfrac{1}{(x+4)^3}$

2. 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: 3, multiplicity 1; 5, multiplicity 3; - 2, multiplicity 1 Degree 5.

b. (5 pts) Zeros: 3, multiplicity 1; 5, multiplicity 2; 2 + 3*i*, multiplicity 1.
Degree 5.

3. (5 pts) Expand $(x-(2-3i))(x-(2+3i))$

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

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. (5 pts) Determine the power function that $f(x)$ resembles for large $|x|$. This is the End Behavior part of the question. Show the end behavior with a simple figure or diagram.

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

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

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

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

6. (10 pts) Use Descarte's Rule of Signs and the Rational Zeros Theorem to find all the real zeros of $f(x) = 3x^5 - 17x^4 + 25x^3 + 65x^2 - 128x + 52$. Then use the *real* zeros to factor f over the real numbers. This is *likely* to involve an irreducible quadratic factor. I would advise using scratch paper to *find* the zeros and then do the work with *them* to break down f in the space below.

7. (5 pts) Based on your work in #6, above, find *all* the (real *and* nonreal) zeros of $f(x) = 3x^5 - 17x^4 + 25x^3 + 65x^2 - 128x + 52$. Use *all* the zeros to write $f(x)$ as the product of *linear* factors.

8. (5 pts) Divide $f(x) = 2x^4 - 3x^3 + x - 3$ by $f(x) = x^2 - 2$. Write your final answer in the form $f(x) = (\text{Divisor})(\text{Quotient}) + \text{Remainder}$

9. (10 pts) Graph the function $R(x)=\dfrac{2x^3+10x^2+16x+8}{x^3-2x^2-5x+6}=\dfrac{(2x^2+6x+4)(x+2)}{(x^2+x-2)(x-3)}$. Key features are asymptotes, holes (if any) and intercepts. I partially factored it for you. :o)