Test 3, Chapter 3 80 Points   Name_____

1.(5 pts) Form a polynomial in factored form with *real* coefficients with the given zeros and degree.
   Please do not expand the polynomial.

Zeros: $x = 2$, multiplicity 2; $x = -1$, multiplicity 2. Degree 4.

2. (10 pts) Expand $(x - (2 + i))(x - (2 - i))$

3.   (10 pts) Use synthetic division to find $P(3)$ if $P(x) = 3x^4 - 2x^3 + 2x^2 - x + 3$.

4.   (5 pts)   Divide $f(x) = 2x^4 - x^3 + 2x^2 - 5$ by $d(x) = x^2 + 3$. Then write the result in the form
   $Dividend = Divisor \cdot Quotient + Remainder$.

5.   Let $f(x) = 3x^5 - 15x^4 + 21x^3 + 3x^2 - 24x + 12$, and suppose its factored form is given by

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

        a.   (10 pts) List each real zero and its multiplicity. Determine whether the graph of $f(x)$ touches or crosses the x-axis at the corresponding x-intercepts.

        b.   (5 pts) What power function does f resemble for large values of $|x|$? In other words, give the end behavior for f, along with a simple diagram.

        c.   (5 pts) Use your work, above, to help you sketch the graph of $f(x)$, showing all intercepts (including the y-intercept).

6. Use your sketch from the previous problem to help you solve the following inequalities. You might want to re-sketch it, below, just to have it on the same page.

a. (5 pts) $3(x-2)^2(x+1)(x-1)^2 > 0$

b. (5 pts) $\dfrac{3(x-2)^2}{(x+1)(x-1)^2} \geq 0$ (A very different-looking function, but not so very different, when it comes to solving inequalities).

7.   Let $f(x) = x^5 - 5x^4 + x^3 + 39x^2 - 88x + 60$

    a. (10 pts) Find the *real* zeros of $f(x)$. Factor f over the set of real numbers. Use scratch paper (the back of page 5) to make your guesses, and then use the *correct* guesses to break f down in the space, below.

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

8. (10 pts) Suppose $R(x) = \dfrac{2x^3 - 16x^2 + 2x + 84}{x^3 - x^2 - 10x - 8}$ can be factored into $\dfrac{2(x-3)(x+2)(x-7)}{(x+2)(x-4)(x+1)}$.

(It can.) Sketch the graph of R showing all intercepts, asymptotes and holes (if any).