MAT 121 50 Points
Test 3, Chapter 3 Take-Home
This Test is Due Friday, November 16th

Fall, 2012

Name________________________

1. 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.

   $(x+4)^2(x-2)^3$

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

   $(x-2)(x-5)^2(x-(7-8i))(x-(7+8i))$

2. (5 pts) Expand $(x-(3+6i))(x-(3-6i))$ $= (x-3-6i)(x-3+6i)$

$= x^2-3x+6ix-3x+9-18i-6ix+18i-36i^2$

$= x^2-6x+9+36 = x^2-6x+45$

3. (5 pts) Use synthetic division to find $P(2)$ if $P(x) = x^4-5x^3+11x^2-12x+13$.

2	1	-5	11	-12	13
		2	-6	10	-4
	1	-3	5	-2	9 = P(2)

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

$2x^2-3x+2 \quad r\ -2x-1$

$x^2-1 \overline{)\,2x^4-3x^3+0x^2+x-3}$

$-(2x^4 \quad -2x^2)$

$-3x^3+2x^2+x-3$

$-(-3x^3 \quad +3x)$

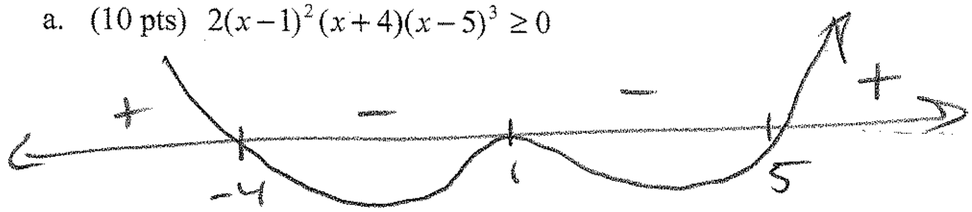
$2x^2-2x-3$

$-(2x^2 \quad -2)$

$-2x-1$

6. Solve the inequalities (Hint: You already laid the foundations for *both* of these in the previous problem.).

   a. (10 pts) $2(x-1)^2(x+4)(x-5)^3 \geq 0$



$x \in (-\infty, -4] \cup \{1\} \cup [5, \infty)$

   b. (5 pts) $\dfrac{(x+4)(x-1)^2}{(x-5)^3} \geq 0$ (Hint: This one differs only *slightly* from the previous one.)

$x \in (-\infty, -4] \cup \{1\} \cup (5, \infty)$

8. (10 pts) Graph the function $R(x) = \frac{2x^3 - 3x^2 - 2x + 3}{x^3 - 4x^2 + x + 6} = \frac{(x-1)(2x-3)(x+1)}{(x+1)(x-2)(x-3)}$. Key features are asymptotes, holes (if any) and intercepts. I was kind enough to factor it for you.

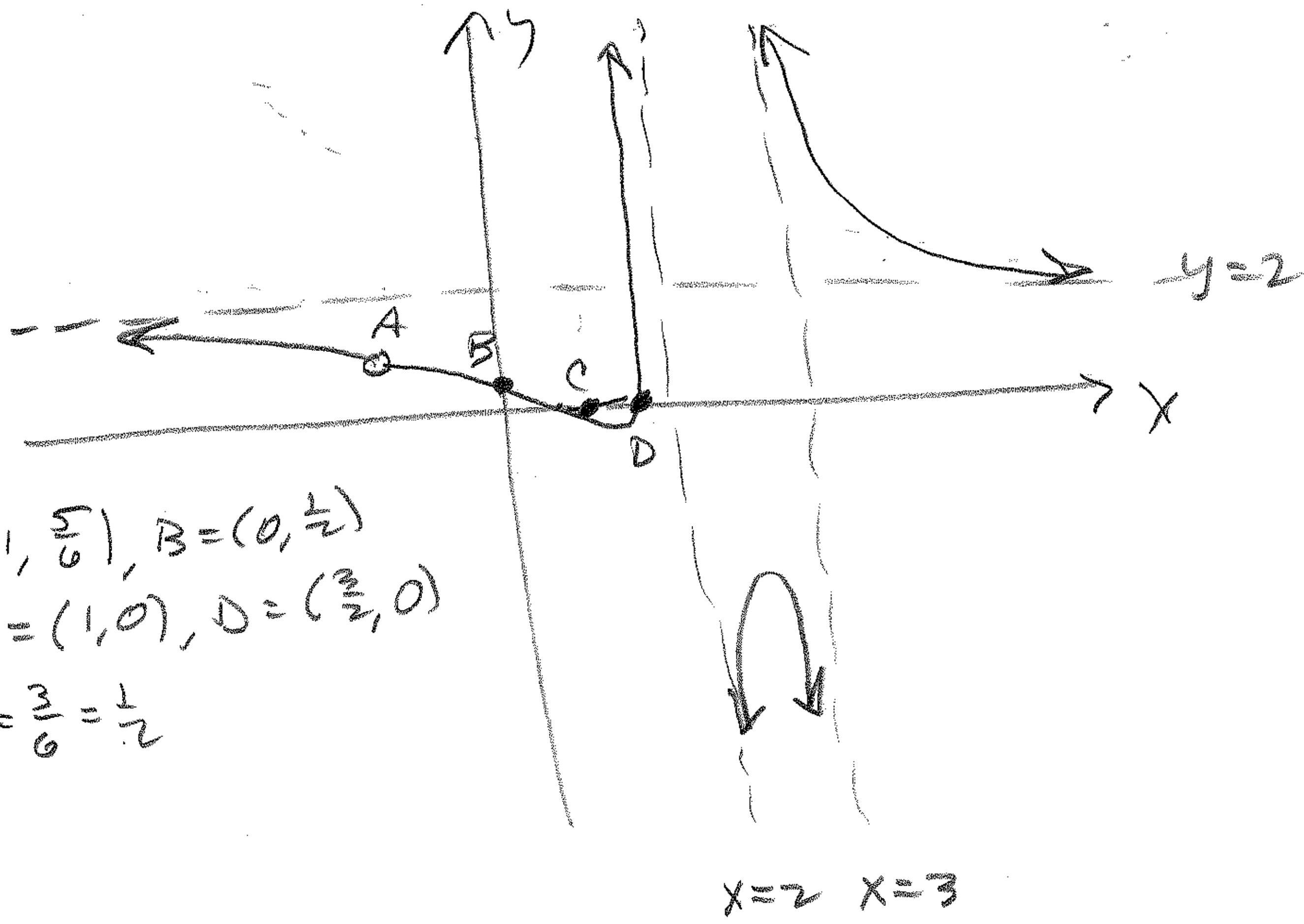
$\mathcal{D} = \mathbb{R} \setminus \{-1, 2, 3\}$ (x+1)'s cancel, so

$x = -1$ is a hole $\frac{(-1-1)(2(-1)-3)}{(-1-2)(-1-3)} = \frac{-2(-5)}{-3(-4)} = \frac{10}{12} = \frac{5}{6}$

$x = 2$, $x = 3$ are vertical asymptotes HOLE: $(-1, \frac{5}{6})$

End Behavior $\frac{n=3}{n=3} \rightarrow y = \frac{2x^3}{x^3} = 2$ is Horizontal Asymptote

Zeros: $x = 1$, $x = \frac{3}{2}$



$A = (-1, \frac{5}{6})$, $B = (0, \frac{1}{2})$

$C = (1, 0)$, $D = (\frac{3}{2}, 0)$

$R(0) = \frac{3}{6} = \frac{1}{2}$