Exam I Review Sheet
MATH 121B, Winter 2003

This exam will cover sections 1.1-2.3 in your text. You should know general terms and definitions from each of these sections, review the homework and quizzes given for these sections, and pay particular attention to the subjects and practice problems mentioned below.

1. Properties of $+$, $-$, $\times$, $\div$ for the real numbers
2. Relationships between the natural, integer, rational, irrational, and real numbers.
3. Adding, subtracting, multiplying, simplifying, and factoring polynomial expressions.
4. Adding, subtracting, multiplying, dividing, and simplifying rational expressions.
5. Working with negative and rational exponents and radical signs.
6. Converting between decimal and scientific notation.
7. Rationalizing the numerator or denominator.
10. Solving Linear inequalities, expressing solutions in both interval notation and graphically.

Below is a list of sample problems. This list is not all-inclusive, but does represent the types of problems you will see on the exam.

1. Identify the property of real numbers being demonstrated (i.e. “associative property of addition”).
   \[ x + 4 = 4 + x \quad (9 \cdot 5) \cdot 5 = 9 \cdot (5 \cdot 5) \quad 7x(2x - 1) = 14x^2 - 7x \quad 4\left(\frac{1}{4}\right) = 1 \]

2. In each case, indicate if the statement is true or false.
   “All rational numbers are integers” “All irrational numbers are real”
   “No integer is a natural number” “No rational number is irrational”

3. Perform the following operations on polynomials, simplifying completely.
   \[
   (x^3 - 2x^2 + x - 1) + (x^2 - 4x + 1) \quad (4x^2 + 3x^2 - 1) - (3x^2 - x + 5) \\
   (4x - 3)(2x + 5) \quad (x + 2)^2 - (2x - 1)(x + 3) \\
   (x + 1)[(x - 1)^2 + (x + 1)^2] \quad (x + 2)(2x - 1)(x - 2) + (x + 2)^2
   \]

4. Factor the following polynomials completely.
   \[x^2 - 4x + 16 \quad 4x^3 - 16x \quad (a^2 + 1)^2 - 7(a^2 + 1) + 10\]

5. Perform the indicated operation on rational expressions, simplifying completely.
   \[\frac{1}{x+1} - \frac{2}{x-3} \quad \frac{x}{x^2-x-6} - \frac{1}{x+2} - \frac{2}{x-3}
   \]
   \[\frac{x^{\frac{1}{2}}}{h} \quad \frac{x^2-25}{x^2-10x+25} \cdot \frac{2x^2-8x-10}{x^2-1}
   \]

6. Simplify the following, eliminating any negative exponents.
   \[(27^{\frac{4}{3}})^{-1} \quad \frac{a^{-2}b^3}{b^m} \quad \left(\frac{a^{-1}r^{-3}}{b^{-1}s^{-3}}\right)^{-1} \quad \frac{(y^{10}z^{-5})^\frac{1}{5}}{(y^{-2}z^3)^{\frac{1}{3}}}
   \]

7. Convert from decimal to scientific notation, or from scientific to decimal, as appropriate.
   \[7,200,000,000 \quad .00000051 \quad 3.0 \times 10^{-8} \quad 2.5 \times 10^7\]

8. Simplify completely, rationalizing the denominator when appropriate.
9. Solve each of the following equations (story problems may be found in section 2.1 and in the chapter 2 review section).

a. \(4x + 12 = 20\)  
b. \(\frac{x}{3} = \frac{4}{5} + 1\)  
c. \(\frac{1}{3x+2} = 60\)  
d. distance-rate-time  
e. solution-mixture  
f. division of labor

10. Solve each of the following systems of linear equations.

a. \(2x - y = 7\)  
   \(3x + 2y = 15\)  
b. story problem like example 3

11. Solve each of the following inequalities, expressing your answer in interval notation

a. \(x + 3 > 5\)  
b. \(2(7x - 3) \leq 12x + 16\)  
c. \(\frac{2}{3} \geq \frac{2x-3}{12} > \frac{1}{6}\)