Math101, Sections 2 and 3, Spring 2008
Review Sheet for Exam #2: 03–17–08

3 All about lines

3.1 The Rectangular Coordinate System

Know how to plot points in the rectangular coordinate system.

Know the definitions of x and y intercepts for a line. In particular, know that these are actually **points**, and so you need to have two values. For example, the x-intercept of the line described by

$$5x - 2y = 10$$

is the point $(2, 0)$; the y-intercept for the same line is the point $(0, -5)$.

Given an equation for a line, know how to plot it. In addition to 'normal' lines, you should be able to handle plotting vertical and horizontal lines.

Try problems 35, 39, 41, 45, 47 and 49, or any additional problems from out of 33-50 if you feel the need.

3.2 The Slope of a Line

Know the definition of slope, and what geometric significance it carries with it. Given two points on a line, or given an equation of a line, you should be able to compute its slope. You should know what a slope of 0 and undefined slope means.

For example, any of 29-37 should be trivial to find the slope of the line.

Given a point on a line, and the slope of a line, you should be able to sketch a graph of the line. The point tells you where to start, and the slope tells you how to find another point on the line. (Think rise/run).

If you need it, try 38, 41, 42, 43, 44, 45 for practice.

Given two lines, you should be able to determine if they are parallel, perpendicular or neither. Questions to think about are 1.) How do you find the slope of a parallel line? 2.) Given a line, how do you find the slope of a perpendicular line?

Problems that ask you about these ideas are 49-60 any.

3.3 Linear Equations in Two Variables

This looks like the heart of the chapter. Given two pieces of information about a line, you should be able to write down an equation for that line. For example, given two points on the line, or one point on the line and the slope of the line, you should be able to write down an equation for the line.

Oftentimes the most useful way to get an equation out of a couple pieces of information from a line is to use Point-Slope form:

$$y - y_1 = m(x - x_1)$$

where (x_1, y_1) is any point on the line, and m is the slope of the line.

Try problems 19, 23-38 any, 41, 43, 49-60 any, 61, 65.

3.4 Linear Inequalities in Two Variables

Know the three step process for graphing an inequality. 1) graph the boundary line. (dashed if $<$, solid if the inequality is $\leq$. 2) Choose a test point. 3) Shade the appropriate region. When you write these problems up, be sure that the reader can follow your work. For example, it is *extremely* useful to write the words 'Use the Test Point (0,0).'

Look at problems 7-18 any.

4 What Can We Do with Two Lines?

4.1 Two Lines and their intersections

Given two lines, we'd like to look at what happens when we try to 'solve' both of them simultaneously. Geometrically what this means is we'd like to find any and all points the two lines have in common. Algebraically, this means we'd like to find all ordered pair of numbers, (x, y) such that (x, y) is a solution to the algebraic equation.

Look at the chart on page 226, because it helps to understand the geometric significance of what happens with you run into what are called the 'degenerate' cases. These are the two oddball cases where the lines happen to be parallel. If this is the case, they are either the same line, or they never intersect. Algebraically sometimes this isn't obvious!

We have two ways to solve for a system of linear equations. The first is called elimination, and the second is called substitution. My guess is that the exam problem testing on this won't tell you which method to use, so it's up to you to pick which method is easier for the situation.

Good problems to look at are 17-32 any and 39-54 any. Make sure you do enough of these until you run into at least on or both of the degenerate cases (parallel lines).

4.2 Planes

We skipped this section

4.3 'Applications' of Systems of Linear Equations

The exam problem won't be as nice as the book is. I mean that the exam won't have a table set up for you to fill in. So, in order to figure out what table to use, we try and mimic some formula we know, such as $d = rt$, or amt acid = concentration x volume.

Look at problems 19, 27, 31 and 35.

5 Exponents and Polynomials

5.1 Integer Exponents

All of the rules you could possibly ever need to know are summarized on pages 289-290 in the big purple box. You will be asked to apply these rules.

Problems 1-88 are practice problems leading up to the problems that we need to be able to solve. If you feel confident, dive into any of 107-124. Do enough problems so you can solve 121 and 123 confidently, this looks like a good order of difficulty to me.

In addition, you might want to try the following. Simplify until all exponents are positive,

1.

$$\left(\frac{4z^3}{2y^2}\right)^{-3} \cdot \frac{2z^2}{y^{-2}} \cdot \left(\frac{10z^5y^{-2008}}{15z^2y^{-3}}\right)^0 \cdot \frac{z^2y^{-5}}{z^3y^5}.$$

Don't worry about looking at scientific notation. This wasn't covered in the homework or in class.

5.2 Adding and Subtracting Polynomials

This section is really practice leading up to the important stuff: multiplying and dividing polynomials. One common item you need to be quick with is subtracting polynomials, because this shows up so often when doing polynomial long division. You may want to try problems 57, 58, 59, 60 or just wait until the long division section to get practice doing this.

5.3

Skip this section.

5.4 Multiplying Polynomials

It's important you know how to do simple multiplication, such as 8-13 any.

It's also important you know how to multiply polynomials where the FOIL method doesn't work. (The big problem with this method is it doesn't generalize). 15-23 all look like excellent problems to take a peek at.

83 and 84 also look like excellent problems.

5.5 What's next? Polynomial Division

What can I say. Know how to do polynomial long division. Know how to deal with the remainder if it's not zero.

I think the most common error will be not subtracting all terms when it comes time to do the subtraction.

Problems 17-46 all look like excellent problems.

6 The Backwards Problem, Factoring Polynomials

After learning how to add, subtract, multiply and divide polynomials, now we do it in reverse order. Sections 6-1 through 6-4 seem a bit jumbled up. I'll point out what's important from these sections, then give you a lot of practice problems.

6.1 Greatest Common Factors; Factoring by Grouping

6.2 Factoring Trinomials

This section is really the heart of the chapter. The goal is to get to the point where you can factor trinomials which are polynomials of the form $ax^2 + bx + c$.

For our purposes, we will not ask you to determine if a polynomial is prime. Whatever problem shows up on the exam, you *will* be able to factor it.

6.3 Special Factoring

We don't want you to have to memorize a lot of formulas. One important factoring to keep in mind is using the formula

$$x^2 - y^2 = (x + y)(x - y).$$

For example, this can be used to factor

$$x^2 - 169.$$

6.4 A General Approach to Factoring

This really seems like a better review section than section inside the chapter. Rather than work on these problems (there are many who are prime, and some of them ask you to use special factorings that we didn't cover), I'll give you practice problems here.

One thing to keep in mind is every time you're asked to factor a polynomial, first look for a common factor that can be pulled out. This will make your life so much easier! Remember this when working on these problems.

2. Factor:

a) $x^2 + 4x - 21$.

b) $y^2 + 3y - 10$.

c) $a^2 + 3a - 130$.

d) $4x^2 + 32x + 28$.

e) $x^3 - 4x$.

f) $j^2 - j - 56$.

g) $3x^2 + 3x - 6$.

h) $z^3 - 2z^2 - 35z$.

i) $2x^2 - 18$.

j) $y^2 + 3y - 130$.

k) $z^3 - 4z^2$

l) $5k^2 - 20k + 225$.

m) $p^2 - 24p + 144$.

n) $n^2 + 14n + 49$.

6.5 Solving Equations by Factoring

Do the homework problems. Below is an extremely brief description of what's in this section.

This is where we solve our *first* non-linear equation! In order to make any headway, we need to zero factor property, defined on page 360.

There are two tools to keep in mind when solving these problems. First, the problem may be handed to you on a silver platter, like solve

3.

$$(x - 5)(x + 60) = 0.$$

More likely, the problem will require a bit of work, namely factoring a trinomial, and before that can be done you need to get all your terms to one side. Similar to solve

4.

$$2x^2 = 3 - x.$$

Sometimes when trying to solve something like

$$(3y + 2)(y - 3) = 7y - 1$$

one needs to do a bit of work. Now with this problem, some idiot decided to to a half job of factoring it. The left hand side is factored, but in this case it doesn't do us any good!

The tool to keep in mind, with a problem like this, is to multiply everything out first. Then after doing that, you can get all terms to one side, and you've reduced it down to factoring a trinomial.

So, with that being said,
5. Find the solution set for

$$(3y + 2)(y - 3) = 7y - 1.$$