HOMEWORK 3
DUE WEDNESDAY, 6 FEBRUARY 2008

MATH 215 - LINEAR ALGEBRA - TOM LAGATTA

- Read pages 29-46, 58-65 in the textbook (Sections 1.3 and 2.1).
- **Section 1.3:** 9, 10, 11, 12, 13, 14, 15, 16, 20, 21, 22, 23, 24, 27
- **MATLAB 1:** Let `u` = `[1 0 0]` and `v` = `[0 1 0]`. Calculate (and turn in) the cross products `w1` = `cross(u,v)` and `w2` = `cross(v,u)`. You see how these aren't the same? Unlike everything else we've discussed thus far, the cross product is *not* commutative.
- **MATLAB 2:** Go to the following page: `http://www.math.umd.edu/~jmr/241/lines_planes.html`. Read Examples 1 through 3 (up to the first plot, you can ignore the second). Your assignment is to input all of the given code in your own MATLAB, and print out the plot you get. You only need to turn in the plot.
- **Exam Review:**
  - Questions from 1.3 will be straightforward, taken exactly from the homework questions above but with different values. Questions from 1.1 and 1.2 will be more conceptual (that is, harder). The computations on the example will be simple so you should not bring a calculator. The exam will be 75 minutes long.
  - **Proofs:** Be able to give a good proof of everything in Theorem 1.1; work through a few of these for practice, for example, (a), (d), (g), and (h). Be able to identify what facts your proof relies on (e.g., distributivity of real numbers). Same thing for Theorems 1.2 and 1.3. Work through the proof of the Triangle Inequality, relying on the Cauchy-Schwarz Inequality. I gave you lots of good proofs to do on HW2, make sure you could do them under the timed pressure of the exam!
  - **Computations:** Be able to compute dot products, lengths, etc. I will give you the formula
    $$\text{proj}_{\mathbf{u}}(\mathbf{v}) = \left(\frac{\mathbf{u}\cdot\mathbf{v}}{\mathbf{u}\cdot\mathbf{u}}\right)\mathbf{u},$$
    but you need to know how to apply it. Examples: 1.2 question 63 or 1.3 question 27.
  - You had better remember that
    $$\|\mathbf{u}+\mathbf{v}\|^2 = \|\mathbf{u}\|^2 + 2\mathbf{u}\cdot\mathbf{v} + \|\mathbf{v}\|^2.$$
    The middle term is *not* $2\|\mathbf{u}\|\|\mathbf{v}\|$. How are these two expressions related? (Hint: Think of the two named Inequalities you know)

Date: Spring 2008.