HOMEWORK ASSIGNMENT # 1

MATH 211, FALL 2006, WILLIAMS COLLEGE

ABSTRACT. This assignment has six problems on two pages. It is due on Monday, September 18 in class. Talk with me if you have difficulty. Good Luck!

1. Problem One

Describe, in your own words, the geometric way to multiply complex numbers. Draw pictures and explain in full sentences. Integrate any formulae you use into your text. [*Hint: Try to write a small section of textbook.*]

2. Problem Two

Recall that $\mathbb{R}^n \subset \mathbb{C}^n$ in a natural way. But there is also a way to think of $\mathbb{C}^n$ as a real vector space. Thinking of $\mathbb{C}$ as ordered pairs of real numbers, we can forget the complex multiplication and identify the complex n-vector $v = (a_1 + ib_1, \ldots, a_n + ib_n)$ with the real $2n$-vector $v' = (a_1, b_1, a_2, b_2, \ldots, a_n, b_n)$. This gives a view of $\mathbb{C}^n$ as a copy of $\mathbb{R}^{2n}$. How are the notions of length in these two spaces related? That is, how is $||v||_{\mathbb{C}^n}$ related to $||v'||_{\mathbb{R}^{2n}}$?

3. Problem Three

Describe the differences between the algebra of matrices and the algebra of real (or complex) numbers. Highlight your discussion with examples.

4. Problem Four

List two linear algebra textbooks (other than our text) that can be found in either Schow or the Math commons. Give title, author and title of the first chapter.

Date: September 11, 2006.

5. Problem Five

Is it true that every real square matrix can be written as the sum of symmetric matrix and a skew symmetric matrix? If so, show how to do it. If false, give a counter example.

6. Problem Six

(1) Suppose that L_1, L_2 are two hyperplanes in $\mathbb{R}^2$. What shape can their intesection take? Give some representative examples of the possibilities.
(2) Do the same for two hyperplanes L_1, L_2 in $\mathbb{R}^3$.
(3) Do the same for three hyperplanes L_1, L_2, L_3 in $\mathbb{R}^3$.