Theory of Matrices

lecture 1, 1/21/09

Syllabus - HW - can work together, come to office for help, but must write up own work.
Show work - answers often in text.
Late HW - penalty for unexcused.
Reading - read text and assigned problems (most proofs are in "solved problems.")
Theory/Proofs - very important part of course. Expected to read, listen to, write proofs. See "Guidelines for Writing Proofs," and follow.
Review - see handout on background material.

Vector Spaces [see §4.1 for notation]

In basic linear algebra we primarily studied the vector space $\mathbb{R}^n = \{(a_1, a_2, \dots, a_n) \mid a_i \in \mathbb{R}\}$ with vector addition and scalar multiplication defined componentwise.

We generalize this, using as axioms the basic properties we know about $\mathbb{R}^n$. [see Theorem 1.1, p4]

In general, scalars are taken from an arbitrary field K. A field is an algebraic structure similar to $\mathbb{R}$: a set with addition and multiplication defined satisfying associative, commutative, and distributive laws, containing additive and multiplicative identities $(0, 1)$ and additive inverses for all elements, multiplicative inverses for nonzero elements.

Examples are $\mathbb{Q}$ (rationals), $\mathbb{R}$ (reals), $\mathbb{C}$ (complex numbers)

Most theorems and definitions will be stated for an arbitrary field K, but it is usually no harm to substitute $\mathbb{R}$ for K (or at least think of K as $\mathbb{R}$).