Comments for Lecture 6
2.3.2010

Start homework 2 as soon as possible!

"The Function".

Given a system of linear equations with an $m \times n$ coefficient matrix C, the system looks like:

$$c_{11}x_1 + c_{12}x_2 + \ldots + c_{1n}x_n = k_1$$
$$c_{21}x_1 + c_{22}x_2 + \ldots + c_{2n}x_n = k_2$$
$$\vdots \qquad \vdots \qquad \vdots \qquad = \vdots$$
$$c_{m1}x_1 + c_{m2}x_2 + \ldots + c_{mn}x_n = k_m$$

We talked about how we can actually think of this as a function. The input here would be the n-*tuple*: $\mathbf{x} = (x_1, x_2, \ldots, x_n)$ and the output would be the m-*tuple*: $\mathbf{k} = (k_1, k_2, \ldots, k_m)$. So now we think of C as a function having domain $\mathbb{R}^n$ and codomain $\mathbb{R}^m$ written:

$$C : \mathbb{R}^n \to \mathbb{R}^m$$

(NOTE: The dimentions of C as a matrix are $m \times n$)
and we write

$$C(\mathbf{x}) = \mathbf{k}$$

As we discussed in class **Theorem 1.6.2** was extremely nice because we were able to determine exactly when C is *onto* and when it is *one-to-one*. An amazing thing is that we can get this information for free when we compute *rank* of C!