Math 223, Section 201
Homework #4
due Friday, February 8, 2002 at the beginning of class

Warm-Up Questions—do not hand in

I. Lay, Section 1.8, p. 84, #31 and #32

II. Lay, Section 1.8, p. 84, #36

III. For which value(s) of h is the matrix transformation $T(\mathbf{x}) = A\mathbf{x}$ one-to-one, where $A = \begin{bmatrix} 1 & 2 & 3 \\ -2 & 1 & 4 \\ -1 & -3 & h \end{bmatrix}$? For which value(s) of h is it onto?

IV. Lay, Section 1.9, p. 92, #1

V. Lay, Section 2.1, p. 107, #1 and #2

VI. Lay, Supplementary Exercises to Chapter 1, p. 95, #1

February 8's quiz will be one of the first five warm-up questions.

Homework Questions—hand these in

I. Lay, Section 1.8, p. 84, #26 and #28

II. Lay, Section 1.9, p. 93, #4

III. Pick two vectors $\mathbf{b}$ and $\mathbf{u}$ in $\mathbb{R}^n$. Let L be the set of all vectors of the form $\mathbf{b} + t\mathbf{u}$ as t varies over all real numbers. (This is a line in $\mathbb{R}^n$ if $\mathbf{u} \neq 0$, but you don't need to assume $\mathbf{u} \neq 0$ to do this problem.) Show that if $\mathbf{x}_1$, $\mathbf{x}_2$, and $\mathbf{x}_3$ are any three vectors chosen from L, then $\{\mathbf{x}_1, \mathbf{x}_2, \mathbf{x}_3\}$ is linearly dependent.

IV. Let $T : \mathbb{R}^n \to \mathbb{R}^m$ be a linear transformation, and let $\mathbf{x}_1, \dots, \mathbf{x}_k$ be vectors in $\mathbb{R}^n$. Suppose that the set $\{\mathbf{x}_1, \dots, \mathbf{x}_k\}$ is linearly independent, but the set $\{T(\mathbf{x}_1), \dots, T(\mathbf{x}_k)\}$ is linearly dependent. Prove that T is not one-to-one.

V. Lay, Section 2.1, p. 108, #14