Math 223, Section 201 Review for Midterm on February 15, 2002

The midterm will be in the normal lecture room and time. No notes, books, calculators, or other aids are allowed. You must bring your student ID to the midterm. There will be no make-up midterm; only documented medical emergencies are allowable excuses for missing the midterm.

SECTIONS COVERED ON THE MIDTERM:

- 1.1 Systems of Linear Equations
- **1.2** Row Reduction and Echelon Forms
- **1.3** Vector Equations
- **1.4** The Matrix Equation $A\mathbf{x} = \mathbf{b}$
- **1.5** Solution Sets of Linear Systems
- **1.6** Linear Independence

- 1.7 Introduction to Linear Transformations
- 1.8 The Matrix of a Linear Transformation
- 2.1 Matrix Operations
- **2.2** The Inverse of a Matrix
- 2.3 Characterizations of Invertible Matrices

Remember that you are not responsible for topics mentioned neither in lectures nor on the homework (especially involving numerical issues associated with computer linear algebra calculations). You also do not have to memorize theorem numbers, as long as you clearly state whatever facts you invoke in your solutions.

For Chapter 1 and Section 2.1, I suggest that you make sure you can solve the warmup questions on Homeworks 1–4; check your homework answers against the solutions and understand whatever mistakes you might have made; and try to work the practice problems in the sections before looking at the solutions. The same strategy is a good one for Sections 2.1–2.3; I suggest the following problems as a surrogate homework set (do not hand in answers to these problems):

- Lay, Section 2.1, p. 108, #15, #19, #21
- Lay, Section 2.1, p. 109, #31
- Lay, Section 2.2, p. 117–8, #9 and #10
- Lay, Section 2.2, p. 118, #17 and #19
- Lay, Section 2.2, p. 118, #20–24
- Lay, Section 2.3, p. 123–4, #13 and #14
- Lay, Section 2.3, p. 124, #23–26 and #33
- Suppose the product AB is defined and is an invertible matrix. Prove that both A and B are invertible.
- Let A be an $m \times n$ matrix.
 - I. If m < n, show that there does not exist a matrix B such that $BA = I_n$.
 - II. If m > n, show that there does not exist a matrix C such that $AC = I_m$.
- Let $T : \mathbb{R}^n \to \mathbb{R}^m$ be a linear transformation.
 - I. If m < n, show that T is not one-to-one.
 - II. If m > n, show that T is not onto.
 - III. If $m \neq n$, show that T is not invertible.