

Math 2255 Midterm Info Sheet

The purpose of this handout is to help you study by listing the concepts, definitions, and results you will need to know for the midterm.

Midterm Information. The midterm will be on Monday, Oct. 16, 2006. You will **not** be allowed to bring in any notes, use the text book, or use a calculator. **Bring your STUDENT ID.**

Material Covered. The exam will cover all the material discussed in class about Sections 1.1 through 1.9 and Sections 2.1 and 2.2 of the textbook.

I have given a breakdown of what you will need to know from each section.

Section 1.1. Know what the following are: linear equation, system of linear equations, solution set, consistent, inconsistent, coefficient matrix, augmented matrix. Know how to solve a linear system using the elementary row operations. Know what the two fundamental questions about a linear system are.

Section 1.2. Know what is meant by the echelon form and reduced row echelon form of a matrix. Know the statement of Theorem 1. Understand what we mean by a pivot position and pivot column, and how to find them. Be able to use the row reduction algorithm. Know the difference between a basic variable and a free variable, and how to write a general solution to a system. Be able to use Theorem 2 to decide how many solutions a system of linear equations has.

Section 1.3. Know what a vector is, their geometric description, and their basic algebraic properties. Know what we mean by a vector equation and linear combination. Understand what is meant by the span of a set of vectors (Definition on page 35.)

Section 1.4. Know what is meant by $A\mathbf{x}$. Know how to use Theorem 3 to change solutions to $A\mathbf{x} = \mathbf{b}$ to solutions of a system of linear equations. Know the definition of what it means for columns of A to span \mathbb{R}^m , and how to check this condition (see Theorem 4). Know properties of Matrix-Vector Product (Theorem 5).

Section 1.5. Know the difference between a homogeneous and nonhomogeneous solution set. Know how to determine if $A\mathbf{x} = \mathbf{0}$ has a non-trivial solution. Be able to express your solutions in parametric form (like in Example 3 and on page 54).

Section 1.6. Understand the two applications discussed in class: equilibrium prices and network flows. You will not be tested on balancing chemical equations.

Section 1.7. Know the definition of page 65. Know how to determine if the columns of a matrix A are linear independent. Know what it means for one or two vectors to be linear dependent. Know Theorems 7, 8, and 9.

Section 1.8. Know what a transformation is, and what a linear transformation is. Note that a matrix gives rise to a linear transformation. Be able to do problems like Example 3.

Section 1.9. Know Theorem 10, i.e., how to use the fact that T is a linear transformation to find the standard matrix for the linear transformation. Know the difference between an one-to-one and onto function, and how to determine if a linear transformation has these properties (see Theorem 12 and the discussion in class).

Section 2.1. Know the basic operations (addition, multiplication) for matrices. Know Theorems 1 and 2, and pay attention to the Warning on page 114. Also know what a transpose is, and some of its properties (Theorem 3).

Section 2.2. Know what the the inverse of a matrix is. You should know the formula for finding A^{-1} when A is a 2×2 matrix (see Theorem 4). As well, you need to know how to compute the inverse of a $n \times n$ matrix. For example, you should be able to do problems like Example 7 of the section. Know also the properties of inverses (Theorem 6). You can skip the material on elementary matrices.

Note: I will be out of town Oct. 6-10. During that time, I will not be able to answer questions. Also, I will not be at the exam; another Professor from the department will be proctoring this test.