

Math 225, Spring 2010: Midterm 1 Summary

This is a list of the main ideas and results covered in each section of the book. You should make sure you understand them all!

Chapter 1: Linear Equations in Linear Algebra

1.1 Systems of Linear Equations

- Matrix of coefficients; augmented matrix of coefficients
- Elementary row operations

1.2 Row Reduction and Echelon Forms

- echelon form
- pivots
- row reduction algorithm

1.3 Vector Equations

- linear combinations of vectors
- vector equation corresponding to $Ax=b$
- $\text{Span}\{v_1, v_2, \dots, v_n\}$

1.4 The Matrix Equation $Ax=b$

- Ax as linear combination of columns of A
- Theorem 1.4: T.F.A.E.:
 - $Ax=b$ has a solution for all b
 - Every b is a linear combination of the columns of A
 - The columns of A span \mathbb{R}^m
 - A has a pivot in every row
- Properties of matrix multiplication

1.5 Solution Sets of Linear Systems

- For $Ax=0$
- For $Ax=b$

1.6 Applications

- In class we only covered chemical equations

1.7 Linear Independence

- Definition of linear **dependence** and linear **independence**
- Meaning of linear dependence for a set of two vectors
- Relation with existence of solutions for $Ax=0$
- Sets of p vector in \mathbb{R}^n if $p>n$

Chapter 2:

2.1 Matrix Operations

- addition, scalar multiplication
- matrix multiplication
- Properties (see Theorem 2)
- Transpose