MATH2270: Midterm 1 Study Guide

The following is an overview of the material that will be covered on the first exam.

§1.1 Systems of Linear Equations

- Solving linear systems of equations by row reducing an augmented matrix.
- Determining the existence and uniqueness of solutions to a linear system.

§1.2 Row Reduction and Echelon Forms

- Row reduction of matrices to echelon or reduced echelon form.
- Identifying pivot positions in a matrix.
- Identifying basic and free variables in a linear system and giving a parametric description of the solution set.

§1.3 Vector Equations

- Be comfortable with performing basic vetor operations of addition and scalar multiplication.
- Writing a linear system of equations as a vector equation and vise versa.
- The definition of the span of a set of vectors in $\mathbb{R}^n$ and a geometric understanding of the span.
- The definition of a linear combination of vectors.

§1.4 The Matrix Equation $A\vec{x} = \vec{b}$

- Solving matrix equations.
- Translating between matrix equations, linear systems of equations, and vector equations.
- Theorem 4 says how all the concepts discussed thus far are connected.

§1.5 Solution Sets of Linear Systems

- Solutions to homogeneous and nonhomogeneous systems of equations.
- Describing the solution set of a linear system in parametric vector form.

§1.6 Applications of Linear Systems

- Balancing chemical equations.
- Network flow.

§1.7 Linear Independence

- Definition of linearly independent/dependent sets.
- Determining whether a given set of vectors is linearly independent or not.
- A geometric description of linearly independent sets.

§1.8 Introduction to Linear Transformations

- Definition of a linear transformation.
- Determining whether a given function is a linear transformation.

§1.9 The Matrix of a Linear Transformation

- Finding the matrix of a linear transformation.
- 1-1 and onto linear transformations (and characterizations thereof).

§2.1 Matrix Operations

- You should be comfortable with the basic algebra of matrices, including addition, scalar multiplication, and matrix multiplication.

§2.2 The Inverse of a Matrix

- You should be able to write down the inverse of a 2×2 matrix.
- Use our algorithm for computing the inverse of a matrix.
- Check whether two matrices are inverses of one another.

§2.3 Characterizations of Invertible Matrices

- Determine whether a matrix (or linear transformation) is invertible.

§2.4 Partitioned Matrices

- Matrix Computations with block matrices.