Math 224
Daily Objectives
Class Session 1
Tuesday, August 28, 2007

A. **1.1: Vectors in Euclidean Spaces**

- What is a **vector**?
- What is the i-th **component** of a vector?
- When do we say that two vectors are **equal**?
- What is the **zero vector**?
- Vector Algebra in $\mathbf{R}^n$ (Def. 1.1)
- Geometric visualization of addition and subtraction of vectors
- Geometric visualization of multiplication of a vector by a scalar
- Properties of Vector Algebra in $\mathbf{R}^n$ (Thm. 1.1)
- **Parallel** vectors (Def. 1.2)
- **Linear Combination** (Def. 1.3)
- Standard basis vectors in $\mathbf{R}^n$
- **Span** of vectors (Def. 1.4)
- Column vectors; row vectors; transpose of a vector

B. **1.2: The Norm and the Dot Product**

- **Norm** or **magnitude** of a vector in $\mathbf{R}^n$ (Def. 1.5)
- Properties of the Norm in $\mathbf{R}^n$ (Thm. 1.2)
- Unit vector
- Dot product (Def. 1.6)
- Angle between two nonzero vectors (and how to derive the formula using vector geometry and the law of cosines)
- Properties of the Dot Product in $\mathbf{R}^n$ (Thm. 1.3)
- Express the norm of a vector in terms of the dot product
- **Perpendicular** or **orthogonal** vectors
- The **Schwarz Inequality** (Thm. 1.4). Know how to *prove* the Schwarz Inequality.
- Know how to prove the **Triangle Inequality** using the Schwarz Inequality.