Inner Product, Length, Orthogonality

We are going to be looking at length, distance, and perpendicularity. You've probably seen this in $\mathbb{R}^2$ and $\mathbb{R}^3$, but now we will generalize to $\mathbb{R}^n$.

Inner Product

Definition of Inner Product: (AKA Dot Product)

Example 24.1:

Theorem 24.2: Dot Product Properties

Length of a Vector

Definition of Length of a Vector: Think length of a line segment.

Unit Vector and Normalizing:

Example 24.3:

Example 24.4:

Distance in $\mathbb{R}^n$:

Definition of Distance Between Two Vectors:

Example 24.5:

Example 24.5

Orthogonal Vectors

Idea for Orthogonality:

Definition of Orthogonality in $\mathbb{R}^n$:

Theorem 24.6 – **The Pythagorean Theorem**

Orthogonal Complements:

Properties of Orthogonal Complements:

Theorem 24.7: