

Chapter 6

November 12, 2025

6.1

6.2

6.3 Orthonormal bases.

Definition 6.1. *Orthonormal* - This is when two vectors say, \vec{u}_1 and \vec{u}_2 are orthogonal (perpendicular), and both are unit vectors (of length 1). They are called **orthonormal**

To convert two vectors to orthonormal, $\vec{u}_1; \vec{u}_2$, which we are using as basis for some vector space S , we first project them to make them orthogonal, then we normalize both vectors, which we can then use as a coordinate system.

Basis \rightarrow Orthogonal \rightarrow Orthonormal \rightarrow Coordinate System.

From this point forward, orthogonal means orthonormal.

When we want to perform a dot product we are used to the normal notation, but this is limited to Euclidian geometry. As a result we have some new notation.

Euclidian Notation	General Notation
$\vec{u} \cdot \vec{v}$	$\langle \vec{u}, \vec{v} \rangle$

6.3.1 Gran-Schmit Process

This process is used to form orthogonal vectors.

First we will start with an example in 2D.

Example 6.2.

u_1

u_2

