

MATH-332: Linear Algebra

Chapter: 6

Orthogonality and Least SquaresSection 6.3: Orthogonal Projections

pgs. 394 - 402

July 27, 2009

Lecture: Orthogonal Projections**Topics:**

Orthogonal Decomposition Theorem
 Best Approximation Theorem
 Properties of Orthogonal Projections

Problems

Prac: 1
 Prob: 1, 5, 13, 15, 19, 21, 22

Section Goals

- Understand how the concepts of orthogonality, orthogonal compliments, orthogonal projections can be used to define vectors in terms of elements in complimentary spaces and how these representations provide the best approximation to elements in a vector space by those in an associated subspace.

Section Objectives

- State and prove the orthogonal decomposition theorem (6.3.8 on page 395), which states that any vector of a vector space can be decomposed into the sum of two vectors one from an associated subspace and the other from that subspaces orthogonal compliment.
- Provide an example of the orthogonal decomposition theorem using vectors from \mathbb{R}^3 .
- State the best approximation theorem, 6.4.9 on page 398, which characterizes its orthogonal projection into a subspace as the element of that subspace that is closest to the original vector.