KUTAISI INTERNATIONAL UNIVERSITY

Quiz (G-1)

Linear Algebra for Informatics
Fall semester 2024
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Definition

if V is a subspace of $\mathbb{R}^n$ with an orthonormal basis $\vec{u}_1, ..., \vec{u}_m$, then

$$\text{proj}_V \vec{x} = (\vec{u}_1 \cdot \vec{x})\vec{u}_1 + \cdots + (\vec{u}_m \cdot \vec{x})\vec{u}_m \quad \forall \vec{x} \in \mathbb{R}^n$$

Problem

Find the orthogonal projection of $\begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$ onto the subspace of $\mathbb{R}^4$ spanned by $\begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 1 \\ 1 \\ -1 \\ -1 \end{pmatrix}, \begin{pmatrix} 1 \\ -1 \\ -1 \\ 1 \end{pmatrix}$

Problem

Find the angle between the vectors

$$\vec{x} = (1, 0, 0, 0)^T \text{ and } \vec{y} = (1, 1, 1, 1)^T.$$

Problem

Find all vectors orthogonal to both $v = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}$ and $w = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$