

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Given $\vec{u}_1 = \begin{bmatrix} 5 \\ -4 \\ 0 \\ 3 \end{bmatrix}$, $\vec{u}_2 = \begin{bmatrix} 4 \\ 5 \\ 1 \\ 0 \end{bmatrix}$ and $W = \text{Span}\{\mathbf{u}_1, \mathbf{u}_2\}$. Determine if $\{\mathbf{u}_1, \mathbf{u}_2\}$ is an orthogonal basis for W . If it is, make it an orthonormal basis.

2. Given the basis of W in question #1, and the vector $\vec{y} = \begin{bmatrix} 5 \\ 2 \\ 1 \\ -1 \end{bmatrix}$ decompose this vector into $\vec{y} = \vec{y}_{\parallel} + \vec{y}_{\perp}$ with $\vec{y}_{\parallel} = \text{proj}_W \vec{y}$.