

Assignment 5

[2pt] 1. Is the set $\left\{ \begin{bmatrix} 3 \\ 1 \\ 5 \end{bmatrix}, \begin{bmatrix} 7 \\ 4 \\ -5 \end{bmatrix}, \begin{bmatrix} -5 \\ 10 \\ 1 \end{bmatrix} \right\}$ orthogonal?

[2pt] 2. Find the coordinates of $\begin{bmatrix} 7 \\ 4 \end{bmatrix}$ with respect to the orthonormal basis $\mathcal{B} = \left\{ \begin{bmatrix} 1/\sqrt{5} \\ 2/\sqrt{5} \end{bmatrix}, \begin{bmatrix} 2/\sqrt{5} \\ -1/\sqrt{5} \end{bmatrix} \right\}$.

[6pt] 3. For each of the following matrices, decide whether A is orthogonal by calculating $A^T A$. If A is not orthogonal, indicate how the columns of A fail to form an orthonormal set.

(a) $A = \begin{bmatrix} 3/5 & -2/3 \\ 4/5 & 1/2 \end{bmatrix}$

(b) $A = \begin{bmatrix} 1/\sqrt{3} & -1/\sqrt{6} & 1/\sqrt{2} \\ 1/\sqrt{3} & -1/\sqrt{6} & -1/\sqrt{2} \\ 1/\sqrt{3} & 2/\sqrt{6} & 0 \end{bmatrix}$

(c) $A = \begin{bmatrix} 1/\sqrt{9} & 2/\sqrt{6} & 0 & -2/\sqrt{18} \\ 0 & -1/\sqrt{6} & -1/\sqrt{3} & 3/\sqrt{18} \\ 2/\sqrt{9} & -1/\sqrt{6} & 1/\sqrt{3} & 2/\sqrt{18} \\ 2/\sqrt{9} & 0 & -1/\sqrt{3} & -1/\sqrt{18} \end{bmatrix}$