

Problem Set #1

Due Friday, October 17, 2007

1. (i) Normalize the following 4-dimensional vectors and show that they form an orthogonal set:

$$\mathbf{a} = (2, 2, 2, 2) \quad \mathbf{b} = (1, 1, -1, -1) \quad \mathbf{c} = (-3, 3, 3, -3) \quad \mathbf{d} = (2, -2, 2, -2)$$

- (ii) Express the vector $\mathbf{x} = (4, 2, -1, 1)$ in the orthonormal basis consisting of the normalized vectors you found in part (i)
2. Carry out the following matrix multiplication:

$$\begin{pmatrix} 5 & 0 & 0 \\ 0 & 3 & -4 \\ 0 & 4 & 3 \end{pmatrix} \begin{pmatrix} 4 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \end{pmatrix} \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ -1 & 1 & 1 & -1 \\ 1 & -1 & 1 & -1 \end{pmatrix}$$