Department of Pure Mathematics

Module 110PMA207 – Linear Algebra

Assignment 11

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1. Let $\varphi : \mathbb{R}^4 \to \mathbb{R}^4$ be a linear mapping defined by

$$\begin{aligned} \varphi(e_1) &= (-7, 0, 1, 2) \\ \varphi(e_2) &= (17, 2, 37, -8) \\ \varphi(e_3) &= (3, 0, 0, 0) \\ \varphi(e_4) &= (-24, 0, -1, 0) \end{aligned}$$

   Find the matrix which corresponds to φ and compute its determinant.

2. Find all Eigenvalues of the following matrix:

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

3. By geometrical considerations find three pairwise orthogonal Eigenvectors and the corresponding Eigenvalues of the following matrix:

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

4. Find all Eigenvalues and corresponding Eigenvectors of the following matrix:

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