LE 230 Homework : Eigenvalue Problem

Please show all details of your solutions.

9-1 Use the power method to find the largest eigenvalue and its corresponding eigenvector of the following matrices:

(a) $\begin{bmatrix} 11 & -8 & 4 \\ -8 & -1 & -2 \\ 4 & -2 & -4 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & 2 & -2 \\ -2 & 8 & 1 \\ 2 & 4 & -4 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 0 & 1 \\ 1 & -1 & 0 \\ 3 & 0 & 4 \end{bmatrix}$

Try the method with various choices of initial vector. Also, verify the results using MATLAB.

9-2 Repeat 9-1 with

(a) $\begin{bmatrix} 2 & 0 & 1 & 0 \\ 0 & 0 & 3 & 1 \\ 1 & 3 & -4 & -2 \\ 0 & 1 & -2 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 2 & 0 & 1 \\ 2 & 0 & 5 & -1 \\ 0 & 5 & 2 & 1 \\ 1 & -1 & 1 & 4 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 2 & -1 & 0 \\ 0 & -1 & 3 & 0 \\ 1 & 0 & 0 & -1 \end{bmatrix}$

9-3 Apply Wielandt's method of deflation to the following matrices. Show the deflated matrix and determine further eigenvalues.

(a) $\begin{bmatrix} -3 & 1 & 1 \\ 1 & -3 & 1 \\ 1 & 1 & -3 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

(b) $\begin{bmatrix} 31 & 16 & 72 \\ -24 & -12 & -57 \\ -8 & -4 & -19 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 4 \\ -3 \\ -1 \end{bmatrix}$

(c) $\begin{bmatrix} 6 & -2 & -2 \\ 0 & -1 & 1 \\ 3 & -6 & 2 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}$

(b) $\begin{bmatrix} 0 & 2 & -1 \\ -2 & 2 & 1 \\ -3 & 8 & 0 \end{bmatrix}, \mathbf{x}_1 = \begin{bmatrix} 5 \\ 1 \\ 7 \end{bmatrix}$