

SME3023 APPLIED NUMERICAL METHODS FOR ENGINEERS

Matrix Eigenvalue Homework

1. Find the eigenvalues and corresponding eigenvectors of the matrices using the determinant search method. Check your answer against Matlab/Octave eig command.

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

ii. $\begin{pmatrix} 1 & 1 & 2 \\ 0 & 2 & 2 \\ -1 & 1 & 3 \end{pmatrix}$

iii. $\begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$

2. Use the power method to estimate the dominant eigenvalue and its corresponding eigenvector for the matrix

$$A = \begin{pmatrix} 4 & 3 & 2 \\ 3 & 5 & 2 \\ 2 & 2 & 1 \end{pmatrix}$$

Stop when you consider the eigenvalue estimate is correct to two decimal places.

3. Program in Matlab/Octave the code to perform the power method to find the dominant eigenvalue and corresponding eigenvector for the matrices below. Check your result against the eig command.

i. $\begin{pmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$

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