Course 2E1 2004-05 (SF Engineers & MSISS & MEMS)

Sheet 19

Due: in the tutorial sessions first Wednesday/Thursday in the next term

Exercise 1

Find the characteristic polynomials of the following matrices:

(i)
$$\begin{pmatrix} 4 & 0 \\ 0 & -3 \end{pmatrix};$$

(ii) $\begin{pmatrix} 0 & 1 \\ 2 & 0 \end{pmatrix};$
(iii) $\begin{pmatrix} 0 & 1 & 1 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{pmatrix};$
(iv) $\begin{pmatrix} 0 & 1 & 1 \\ 0 & 2 & 2 \\ 0 & 2 & 3 \end{pmatrix}.$

Exercise 2

Find the eigenvalues and the corresponding eigenvectors of the following matrices:

(i)
$$\begin{pmatrix} 2 & 0 \\ 1 & -3 \end{pmatrix};$$

(ii) $\begin{pmatrix} 1 & 1 & 2 \\ 0 & 2 & 4 \\ 0 & 2 & 4 \end{pmatrix};$

Exercise 3

Find a matrix P that diagonalizes the given matrix A and determine $D = P^{-1}AP$:

(i)
$$A = \begin{pmatrix} 0 & 2 \\ 4 & 0 \end{pmatrix};$$

(ii) $A = \begin{pmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{pmatrix}.$