

Course 2E01 2018 (SF Engineers & MSISS & MEMS)**S h e e t 9**

Due: at the end of the tutorial

Exercise 1

Find the characteristic polynomials of the following matrices:

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

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

(iv) $\begin{pmatrix} 0 & -2 & -1 \\ 1 & 0 & 2 \\ 0 & -2 & 1 \end{pmatrix}$.

Exercise 2

For the matrix

$$A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 3 & -2 \\ 0 & -6 & 4 \end{pmatrix},$$

- (i) Find the eigenvalues and corresponding eigenvectors.
- (ii) Find an invertible matrix P and a diagonal matrix D diagonalizing A , i.e. satisfying $P^{-1}AP = D$.

Exercise 3

Use Exercise 2 to solve the system of ordinary differential equations

$$\begin{pmatrix} y_1' \\ y_2' \\ y_3' \end{pmatrix} = A \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix},$$

where A is as in Exercise 2.