

## Experiment:2 Mathematical Operations

### 1. Basic Operations of matrices

Evaluate the following problems by writing a program in a script file and then execute it:

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 5 & -9 & -8 \\ 4 & 7 & 8 \end{bmatrix}, B = \begin{bmatrix} 1 & 6 & 7 \\ -1 & -5 & 1 \\ 1 & 9 & 0 \end{bmatrix}$$

- Create the matrices  $A$  and  $B$ .
- Check the size of both matrices.
- Find  $A + B, A - B, AB, A^2, A(A - 2B)$ .
- Write the command to display only the first row and second row of matrix  $A$ .
- Write the command to display only the first column and second column of matrix  $B$ .
- Find the determinant of both matrices and inverse (if exist).
- Find the transpose of  $A$  and assign it to new matrix  $C$ .
- Display the element  $C_{13}$ .
- Display the second row of the transpose of  $A$ .
- Find the determinant of transpose of  $A$ .

## 2. Matrix manipulation

Given are a  $5 \times 6$  matrix  $A$ , a  $3 \times 6$  matrix  $B$ , and a 9-element vector  $v$

$$(a) A = \begin{bmatrix} 2 & 5 & 8 & 11 & 14 & 17 \\ 3 & 6 & 9 & 12 & 15 & 18 \\ 4 & 7 & 10 & 13 & 16 & 19 \\ 5 & 8 & 11 & 14 & 17 & 20 \\ 6 & 9 & 12 & 15 & 18 & 21 \end{bmatrix}$$

$$(b) B = \begin{bmatrix} 5 & 10 & 15 & 20 & 25 & 30 \\ 30 & 35 & 40 & 45 & 50 & 55 \\ 55 & 60 & 65 & 70 & 75 & 80 \end{bmatrix}$$

$$(c) v = [99 \ 98 \ 97 \ 96 \ 95 \ 94 \ 93 \ 92 \ 91]$$

Create the three arrays in the script, and then, by writing one command, replace the last four columns of the first and third rows of  $A$  with the first four columns of the first two rows of  $B$ , the last four columns of the fourth row of  $A$  with the elements 5 through 8 of  $v$ , and the last four columns of the fifth row of  $A$  with columns 3 through 5 of the third row of  $B$ .

## 3. Calculus and functional operations

Define the following function in the variables  $x$  and  $y$

$$(a) f(x) = 2\sin^2(x) + \log(x) \quad \text{and evaluate } f \text{ when } x = 10 \text{ and } x = \pi$$

$$(b) \text{ find the derivative of } \sin(x) + x^3 + 2x + \cos(4x)$$

$$(c) g(x, y) = \frac{x^2}{y} + \frac{y^3}{x+y} \quad \text{and evaluate } g \text{ when } x = -2 \text{ and } y = -7$$

$$(d) \text{ Define the inverse function and evaluate the inverse of matrix in two ways.}$$