

General Sir John Kotelawala Defence University  
Faculty of Engineering  
Department of Mathematics  
**Mathematical Software - MA 1232**

Learning Outcomes Covered: LO1

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Intake 39 - Semester 2

Tutorial 02

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1. Write down the output of the following MATLAB commands:

- (a)  $A=[1\ 2\ ;\ 3\ 4]$
- (b)  $B=\text{linspace}(0,4,5)$
- (c)  $C=\text{ones}(2,4)$
- (d)  $D=8:-2:0$
- (e)  $E = (1:5)'$
- (f)  $F = \text{zeros}(3,4)$
- (g)  $G = \text{rand}(3,5)$
- (h)  $H = \text{eye}(4,4)$

2. Create the following vectors and matrices in MATLAB

- (a)  $A = [2\ 9\ 7]$
- (b)  $B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$
- (c)  $C = \begin{bmatrix} 1 & 0 & 5 & 2 \\ 9 & 1 & 6 & 3 \\ 2 & 4 & 8 & 6 \end{bmatrix}$
- (d)  $D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
- (e)  $E = \begin{bmatrix} 4 \\ 8 \\ -2 \\ 0 \end{bmatrix}$

3. Consider the following vector.

$$X = \begin{bmatrix} 2 \\ 5 \\ -2 \\ 0 \\ -6 \\ 8 \end{bmatrix}.$$

Write down the correct MATLAB commands to access the following elements.

- (a) -6
- (b)  $a = \begin{bmatrix} 2 \\ 5 \\ -2 \end{bmatrix}$
- (c)  $b = [0\ -6\ 8]$

4. Using the following matrix A and the Element-wise multiplication and the Element-wise division, create the matrix B, C, D.

$$A = \begin{bmatrix} 1 & 2 \\ 5 & 6 \end{bmatrix}$$

$$B = \begin{bmatrix} 2 & 4 \\ 10 & 12 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 4 \\ 25 & 36 \end{bmatrix}$$

$$D = \begin{bmatrix} 0.5 & 1 \\ 2.5 & 3 \end{bmatrix}$$

5. By creating the coefficient matrix and the load vector in MATLAB, solve the following system.

$$x + y - z = 4$$

$$x - 2y + 3z = -6$$

$$2x + 3y + z = 7$$

6. Using the zeros, ones and eye commands create the following matrices:

a)  $\begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$

b)  $\begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix}$

c)  $\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 1 \end{bmatrix}$

7. Create the following two vectors:  $a = [4 \ 10 \ 0.5 \ 1.8 \ 2.3 \ 7]$ ,  $b = [0.4 \ 9 \ 5 \ 3 \ 0.6 \ 12]$

- (a) Use the two vectors in a MATLAB command to create a  $2 \times 4$  matrix such that the first row consists of elements 2 to 5 of vector a, and the second row consists of elements 3 to 6 of vector b
- (b) Use the two vectors in a MATLAB command to create a  $3 \times 4$  matrix such that the first column consists of elements 2 to 4 of vector a, the second column consists of elements 4 to 6 of vector a, the third column consists of elements 1 to 3 of vector b, and the fourth column consists of elements 3 to 5 of vector b

8. Consider the following matrix  $A = \begin{bmatrix} 1 & 5 & 4 & 3 \\ 2 & 8 & 11 & 0 \\ 6 & 7 & 9 & 10 \\ -3 & 12 & -5 & -6 \end{bmatrix}$  and write down the correct MATLAB commands to access the following elements of A

(a)  $B = \begin{bmatrix} 8 & 11 \\ 7 & 9 \end{bmatrix}$

(b)  $c = \begin{bmatrix} 1 \\ 8 \\ 9 \\ -6 \end{bmatrix}$

(c)  $C = \begin{bmatrix} 1 & 5 & 4 \\ 2 & 8 & 11 \end{bmatrix}$

(d)  $x = [3 \ 0 \ 10 \ -6]$

(e)  $e = \begin{bmatrix} -3 \\ 12 \\ -5 \\ -6 \end{bmatrix}$

9. Construct the following matrices in MATLAB and find:

$$A = \begin{bmatrix} 8 & 7 & 9 & 5 & 7 \\ 9 & 6 & 0 & 5 & 5 \\ 3 & 6 & 0 & 2 & 3 \\ 4 & 6 & 0 & 8 & 9 \\ 2 & 1 & 2 & 1 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 38 \\ -10 \\ 44 \\ -7 \\ 53 \end{bmatrix}$$

- (a) Find the product:  $A^T \times B$
- (b) Find the square of matrix A
- (c) Form a  $3 \times 4$  matrix from A comprising of elements from 3rd, 4th and 5th row and 2nd, 3rd, 4th and 5th column
- (d) Form a  $3 \times 4$  matrix from A comprising of elements from 2nd, 3rd, and 4th row and 1st, 2nd, 3rd, 4th column
- (e) Compute the difference between above 2 steps

(f) Compute element by element square of last step matrix

10. Perform the following operations using correct MATLAB commands. Consider the matrices  $A$  and  $B$ .

$$A = \begin{pmatrix} 2 & 4 & 6 & 8 \\ 3 & 9 & 15 & 21 \\ 4 & 7 & 17 & 25 \\ 9 & 6 & 13 & 30 \end{pmatrix} \quad B = \begin{pmatrix} -1 & 2 & -3 & 4 \\ 5 & 4 & 11 & 12 \\ 43 & 32 & 21 & 10 \\ 8 & 9 & 1 & 0 \end{pmatrix}$$

- (a) Find the Transpose of  $A$ . ( $A^T$ )
- (b) Find the Cube of matrix  $B$ . ( $B^3$ )
- (c) Divide each element of  $A$  by 3 and then get a  $4 \times 1$  matrix by adding the elements of rows.
- (d) If  $AC = B$ , find  $C$ .
- (e) Create a  $4 \times 4$  Identity Matrix  $D$  using the inbuilt command.
- (f) Create a Matrix  $P$ , such that, the first two columns are the two columns of  $C$  and the third and fourth columns are the columns of  $D$ .
- (g) Find the number of rows ( $m$ ) and number of columns ( $n$ ) of  $P$ .
- (h) Extract the first row of  $P$ .
- (i) Find sum of the elements of the second row of  $P$ .
- (j) Replace the third column of  $P$  by zeros.