

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) $b = [0 \quad -6 \quad 8]$

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 2×4 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 3×4 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 3×4 matrix from A comprising of elements from 3rd, 4th and 5th row and 2nd, 3rd, 4th and 5th column
- (d) Form a 3×4 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 the get a 4×1 matrix by adding the elements of rows.
- (d) If $AC = B$, find C .
- (e) Create a 4×4 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 and third and forth 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.