

# MATLAB

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المرحلة الثانية - صباحي

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# **Lecture 7**

(17)

6) To find the difference of two vectors of the same size :

Example (1):

$$\gg B = [3 \ 5 \ 4 \ 2 \ 1]; \leftarrow$$

$$\gg D = [5 \ 6 \ 3 \ 2 \ 9]; \leftarrow$$

$$\gg d1 = B - D \leftarrow$$

$$d1 = \begin{matrix} -2 & -1 & 1 & 0 & -8 \end{matrix}$$

$$\gg d2 = D - B \leftarrow$$

$$d2 = \begin{matrix} 2 & 1 & -1 & 0 & 8 \end{matrix}$$

Example (2):

$$\gg a = [1; 3; 5]; \leftarrow$$

$$\gg b = [2; 4; 1]; \leftarrow$$

$$\gg d1 = a - b \leftarrow$$

$$d1 = \begin{matrix} -1 \\ -1 \\ 4 \end{matrix}$$

$$\gg d2 = b - a \leftarrow$$

$$d2 = \begin{matrix} 1 \\ 1 \\ -4 \end{matrix}$$

(18)

7) To find the element of the minimum value of the vector :

Example :

$\gg D = [5 \ 6 \ 3 \ 2 \ 9]; \downarrow$

$\gg m1 = \min(D) \downarrow$

$m1 = 2$

8) To find the element of the maximum value of the vector :

Example :

$\gg D = [5 \ 6 \ 3 \ 2 \ 9]; \downarrow$

$\gg m2 = \max(D) \downarrow$

$m2 = 9$

9) To find the array multiplication of two vectors of the same size :

Example :

$\gg B = [3 \ 5 \ 4 \ 2 \ 1]; \downarrow$

$\gg D = [5 \ 6 \ 3 \ 2 \ 9]; \downarrow$

$\gg m = B .* D$

$m = 15 \ 30 \ 12 \ 4 \ 9$

(19)

Question: Create the following vectors in MATLAB program

$a = (0 \ 0.3 \ -1.2 \ 3.9 \ -4)$  and do the following commands :

- 1) Round the elements of the vector  $a$  to the nearest integer toward zero.
- 2) Round the elements of the vector  $a$  to the nearest integer toward  $-\infty$ .
- 3) Round the elements of the vector  $a$  to the nearest integer toward  $+\infty$ .
- 4) Round the elements of the vector  $a$  to the nearest integer.
- 5) Apply the suitable function to show whether each element of the vector  $a$  is positive or negative or zero.

Answer :

$\rightarrow a = [0 \ 0.3 \ -1.2 \ 3.9 \ -4]; \leftarrow$

1)  $\text{fix}(a) \leftarrow$

ans =  
0 0 -1 3 -4

(20)

2)  $\rightarrow \rightarrow \text{floor}(a) \leftarrow$

ans = 0 0 -2 3 -4

3)  $\rightarrow \rightarrow \text{ceil}(a) \leftarrow$

ans = 0 1 -1 4 -4

4)  $\rightarrow \rightarrow \text{round}(a) \leftarrow$

ans = 0 0 -1 4 -4

5)  $\rightarrow \rightarrow \text{sign}(a) \leftarrow$

ans = 0 1 -1 1 -1

# **Lecture 8**

(21)

## Matrices :

المصفوفات

An  $m \times n$  matrix  $A$  is a rectangular array of  $mn$  real numbers arranged in  $m$  horizontal rows and  $n$  vertical columns :

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \dots \textcircled{1}$$

The  $i$ th row of  $A$  is  $[a_{i1} \ a_{i2} \ \dots \ a_{in}]$  ( $1 \leq i \leq m$ );

the  $j$ th column of  $A$  is  $\begin{bmatrix} a_{1j} \\ a_{2j} \\ \vdots \\ a_{mj} \end{bmatrix}$  ( $1 \leq j \leq n$ ).

Remark : We shall say that  $A$  is  $m \times n$  matrix. If  $m = n$ , we say that  $A$  is a square matrix of order  $n$ , and that the numbers  $a_{11}, a_{22}, \dots, a_{nn}$  form the main diagonal of  $A$ . We refer to the



(22)

number  $a_{ij}$ , which is in the  $i$ th row and  $j$ th column of  $A$ , as the  $i, j$ th element of  $A$ , or the  $(i, j)$  entry of  $A$ , and we often write ① as  $A = [a_{ij}]$ .

Examples:

1)  $B = \begin{bmatrix} 1 & 3 \\ 5 & 0 \end{bmatrix}$  is a  $2 \times 2$  matrix or  $B$  is a square matrix of order 2.

2)  $C = \begin{bmatrix} 1 & 2 \\ 3 & 5 \\ 7 & 4 \end{bmatrix}$  is a  $3 \times 2$  matrix.

إنشاء المصفوفات في برنامج الـ MATLAB

Creating Matrices in MATLAB Program:

أنشئ المصفوفة التالية ثم أظهرها في برنامج الـ MATLAB

Example: Create the following matrix and display it in MATLAB program

$$D = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Answer:

$\gg D = [1, 2, 3; 4, 5, 6; 7, 8, 9] \ll$

$$D = \begin{array}{ccc} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{array}$$

(23)

Or  $\Rightarrow D = [1\ 2\ 3; 4\ 5\ 6; 7\ 8\ 9]$  ←

$$D = \begin{array}{ccc} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{array}$$

بعض الدوال لإنشاء مصفوفات خاصة وهي:

(1) دالة pascal لإنشاء مصفوفة متناظرة (symmetric matrix).

Example:

$\Rightarrow p = \text{pascal}(3)$  ←

$$p = \begin{array}{ccc} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{array}$$

(2) دالة magic لإنشاء مصفوفة سحرية (magic matrix) يتساوى فيها مجموع عناصر كل صف ومجموع عناصر كل عمود ومجموع عناصر القطر الرئيسي ومجموع عناصر القطر الثانوي.

Example:

$\Rightarrow M = \text{magic}(3)$  ←

$$M = \begin{array}{ccc} 8 & 1 & 6 \\ 3 & 5 & 7 \\ 4 & 9 & 2 \end{array}$$

# **Lecture 9**

(24)

٣) دالة zeros لإنشاء مصفوفة صفرية (Zero Matrix).

Examples:

1)  $\gg Z = \text{zeros}(2, 3) \ll$

$$Z = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

2)  $\gg Z_2 = \text{zeros}(2) \ll$

$$Z_2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

٤) دالة ones لإنشاء مصفوفة واحدة (Ones Matrix) كل عناصرها تساوي 1.

Examples:

1)  $\gg O = \text{ones}(3, 4) \ll$

$$O = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

2)  $\gg O_2 = \text{ones}(3) \ll$

$$O_2 = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

(25)

(Identity Matrix) eye دالة لانشاء مصفوفة محايدة

Examples:

1)  $\gg E = \text{eye}(2) \ll$

$$E = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

2)  $\gg \text{eye}(3) \ll$

$$\text{ans} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

(7) دالة triu لانشاء مصفوفة مثلثية عليا (upper triangular matrix) من مصفوفة مطابقة.

Example: Create an upper triangular matrix from the

$$\text{matrix} \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Answer:

$\gg A = [1 \ 2 \ 3; 4 \ 5 \ 6; 7 \ 8 \ 9]; \ll$

$\gg A1 = \text{triu}(A) \ll$

$$A1 = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 5 & 6 \\ 0 & 0 & 9 \end{bmatrix}$$

(26)

نازل  $\text{tril}$  لانشاء مصفوفة مثلثية سفلية  
(lower triangular matrix) مع مصفوفة  $W$  كالتالي .

Example: Create a lower triangular matrix from the matrix

$$W = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Answer:

$$\Rightarrow W = [1 \ 2 \ 3; 4 \ 5 \ 6; 7 \ 8 \ 9] \leftarrow$$

$$W = \begin{array}{ccc} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{array}$$

$$\Rightarrow L = \text{tril}(W) \leftarrow$$

$$L = \begin{array}{ccc} 1 & 0 & 0 \\ 4 & 5 & 0 \\ 7 & 8 & 9 \end{array}$$