Lecture 7

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

Example (1) :

```
>> B = [3 5 4 2 1]; ↵
>> D = [5 6 3 2 9]; ↵
>> d1 = B - D ↵
d1 =
    -2   -1    1    0   -8

>> d2 = D - B ↵
d2 =
     2    1   -1    0    8
```

Example (2) :

```
>> a = [1; 3; 5]; ↵
>> b = [2; 4; 1]; ↵
>> d1 = a - b ↵
d1 =
    -1
    -1
     4

>> d2 = b - a ↵
d2 =
     1
     1
    -4
```

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

Example :

```
>> D = [5 6 3 2 9]; ↵
>> m1 = min(D) ↵
m1 =
     2
```

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

Example :

```
>> D = [5 6 3 2 9]; ↵
>> m2 = max(D) ↵
m2 =
     9
```

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

Example :

```
>> B = [3 5 4 2 1]; ↵
>> D = [5 6 3 2 9]; ↵
>> 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 :

```
>> a = [0 0.3 -1.2 3.9 -4] ;
```

1) `fix(a)`

```
ans =
     0     0    -1     3    -4
```

2) >> floor(a) ↵

ans = 0 0 -2 3 -4

3) >> ceil(a) ↵

ans = 0 1 -1 4 -4

4) >> round(a) ↵

ans = 0 0 -1 4 -4

5) >> sign(a) ↵

ans = 0 1 -1 1 -1

Lecture 8

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 :

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{12} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix} \quad \cdots\cdots (1)$$

The ith row of A is $[a_{i1}\ a_{i2} \cdots a_{in}]$ $(1 \le i \le m)$;

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

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 $a_{11}, a_{22}, \ldots, a_{nn}$ form the main diagonal of A. We refer to the

number a_{ij}, which is in the ith row and jth column of A, as the i,jth 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 2x2 matrix or B is a square matrix of order 2.

2) $C = \begin{bmatrix} 1 & 2 \\ 3 & 5 \\ 7 & 4 \end{bmatrix}$ is a 3x2 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:

```
>> D=[1,2,3;4,5,6;7,8,9]↵
D =
     1     2     3
     4     5     6
     7     8     9
```

Or >> D = [1 2 3; 4 5 6; 7 8 9] ↵

D =
1 2 3
4 5 6
7 8 9

بعض الدوال لانشاء مصفوفات خاصة وهي :

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

Example :

>> p = pascal(3) ↵

p =
1 1 1
1 2 3
1 3 6

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

Example :

>> M = magic(3) ↵

M =
8 1 6
3 5 7
4 9 2

Lecture 9

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

Examples:

1) >> Z = zeros (2, 3) ↵

Z =
0 0 0
0 0 0

2) >> Z2 = zeros (2) ↵

Z2 =
0 0
0 0

٤) دالة ones لانشاء مصفوفة واحدية (Ones Matrix) كل عناصرها تساوي 1 .

Examples:

1) >> O = ones (3, 4) ↵

O =
1 1 1 1
1 1 1 1
1 1 1 1

2) >> O2 = ones (3) ↵

O2 =
1 1 1
1 1 1
1 1 1

٥) دالة eye لانشاء مصفوفة محايدة (Identity Matrix).

Examples :

1) >> E = eye (2) ↵

E =
1 0
0 1

2) >> eye (3) ↵

ans =
1 0 0
0 1 0
0 0 1

٦) دالة triu لانشاء مصفوفة مثلثية عليا (upper triangular matrix) من مصفوفة معطاة.

Example: Create an upper triangular matrix from the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

Answer :

>> A = [1 2 3; 4 5 6; 7 8 9]; ↵

>> A1 = triu (A) ↵

A1 =
1 2 3
0 5 6
0 0 9

١) دالة tril لانشاء مصفوفة مثلثية سفلى (lower triangular matrix) من مصفوفة معطاة.

Example : Create a lower triangular matrix From the matrix

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

Answer :

```
>> W = [1 2 3; 4 5 6; 7 8 9] ↵
W =
     1     2     3
     4     5     6
     7     8     9
>> L = tril(W) ↵
L =
     1     0     0
     4     5     0
     7     8     9
```