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جزوه درس برنامه‌نویسی

جلسه ســـــوم

۱- ماتریس‌ها و آرایه ها

```
≫ a = [1 2; 2 -1];  <Enter>
≫ b = [4; 3];  <Enter>
≫ x = a\b  <Enter>
```

which result in

```
x =
     2
     1
```

i.e. $x = 2, y = 1$.

```
≫ [x,y] = solve('x+2*y=4','2*x-y=3')  <Enter>
```

```
≫ whos  <Enter>
≫ x = double(x), y = double(y)  <Enter>
≫ whos  <Enter>
```

Precedence	Operator
1	Parentheses (round brackets)
2	Power, left to right
3	Multiplication and division, left to right
4	Addition and subtraction, left to right

1. Evaluate the following MATLAB expressions yourself before checking the answers in MATLAB:

```
1 + 2 * 3
4 / 2 * 2
1+2 / 4
1 + 2\4
2*2 ^ 3
2 * 3 \ 3
2 ^ (1 + 2)/3
1/2e-1
```

2. Use MATLAB to evaluate the following expressions. Answers are in brackets.

   (a) $\frac{1}{2 \times 3}$ (0.1667)

   (b) $2^{2 \times 3}$ (64)

   (c) $1.5 \times 10^{-4} + 2.5 \times 10^{-2}$ (0.0252; use scientific or floating point notation)

Example

Create a script file with the following code –

```
a = [ 1 2 3; 2 3 4; 1 2 5]
b = [ 2 1 3 ; 5 0 -2; 2 3 -1]
prod = a * b
```

Try it

When you run the file, it displays the following result –

```
a =
     1     2     3
     2     3     4
     1     2     5
b =
     2     1     3
     5     0    -2
     2     3    -1
prod =
    18    10    -4
    27    14    -4
    22    16    -6
```

A matrix is a two-dimensional array of numbers.

In MATLAB, you create a matrix by entering elements in each row as comma or space delimited numbers and using semicolons to mark the end of each row.

For example, let us create a 4-by-5 matrix *a* –

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8]
```

Try it

MATLAB will execute the above statement and return the following result –

```
a =
    1    2    3    4    5
    2    3    4    5    6
    3    4    5    6    7
    4    5    6    7    8
```

Referencing the Elements of a Matrix

To reference an element in the m^{th} row and n^{th} column, of a matrix *mx*, we write –

```
mx(m, n);
```

For example, to refer to the element in the 2^{nd} row and 5^{th} column, of the matrix *a*, as created in the last section, we type –

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8];
a(2,5)
```

Try it

MATLAB will execute the above statement and return the following result –

```
ans =  6
```

To reference all the elements in the m^{th} column we type A(:,m).

Let us create a column vector v, from the elements of the 4^{th} row of the matrix a:

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8];
v = a(:,4)
```

Try it

MATLAB will execute the above statement and return the following result –

```
v =
     4
     5
     6
     7
```

You can also select the elements in the m^{th} through n^{th} columns, for this we write –

```
a(:,m:n)
```

Let us create a smaller matrix taking the elements from the second and third columns –

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8];
a(:, 2:3)
```

Try it

MATLAB will execute the above statement and return the following result –

```
ans =
     2     3
     3     4
     4     5
     5     6
```

In the same way, you can create a sub-matrix taking a sub-part of a matrix.

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8];
a(:, 2:3)
```

Try it

MATLAB will execute the above statement and return the following result –

```
ans =
     2     3
     3     4
     4     5
     5     6
```

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For example, let us create a sub-matrix *sa* taking the inner subpart of a:

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```
3     4     5
4     5     6
```

To do this, write –

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8];
sa = a(2:3,2:4)
```

MATLAB will execute the above statement and return the following result –

```
sa =
     3     4     5
     4     5     6
```

Deleting a Row or a Column in a Matrix

You can delete an entire row or column of a matrix by assigning an empty set of square braces [] to that row or column. Basically, [] denotes an empty array.

For example, let us delete the fourth row of a –

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8];
a( 4 , : ) = []
```

MATLAB will execute the above statement and return the following result –

```
a =
     1     2     3     4     5
     2     3     4     5     6
     3     4     5     6     7
```

Next, let us delete the fifth column of a –

```
a = [ 1 2 3 4 5; 2 3 4 5 6; 3 4 5 6 7; 4 5 6 7 8];
a(: , 5)=[]
```