

**SHAID SMARAK COLLEGE**

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*Lab report of MATLAB*

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1st semester

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**Abstract**

It’s out pleasure and duty to submit report of Mathematics. It is the syllabus of BCA first semester program affiliated to Tribhuvan University(TU). The main goial of this lab report is to make students understand about practical knowledge and concept of Mathematica and how to solve mathematical problem in lab. This is the mainpoint of view of the report.**Acknowledgement**

I would like to express my special thanks of gratitude to out teacher “Mr Bharat Pokhrel” who gave us opportunity to make report of Mathematica which helped me in doing a lot of research and I came to know about many things so I am very thankful to them. I would like to thank friends and teacher who helped me in making this project with a limited frame of time.

**LAB REPORT**

**Objective:**

To carryout numerical computations and analysis.

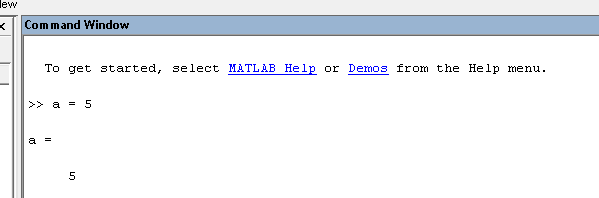
**Introduction:**

MATLAB is an interactive matrix-based system for scientific and engineering numerical computation as well as visualization. MATLAB is developed by MathWorks. It is high level programming language.

There are several commands we must get familiar with to learn how to use the MATLAB.

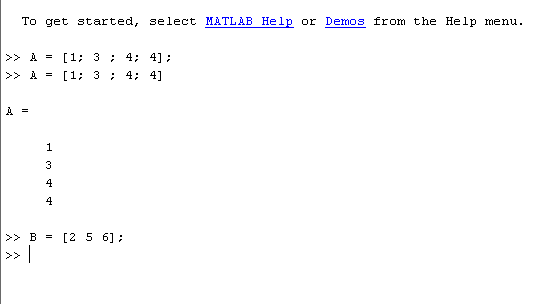
1. >>

This command is the prompt command. It indicates that MATLAB is ready is accept any input.



2. ;(semicolon)

It’s a command that takes us to a next line.



**Assignment**

1. Type

>> x = 4

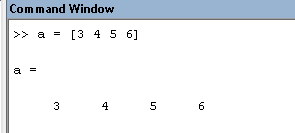
It will display

X=

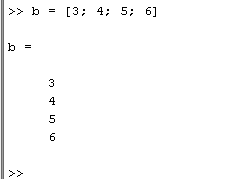
4

2. Assigning Arrays, vectors and Matrices.

An array is a collection of values by a single variable. One dimensional arrays are called vectors and two dimensional arrays are called matrices. For example.



The above image shows that the result is displayed horizontally. Thus the assigned datas are displayed in an array.



In this image the result is displayed vertically. Thus the displayed result is in vector form.

Finally, A matrix can be displayed as follows:

>> A = [ 1 0 3; 3 0 5; 9 8 7]

A =

1 0 3

3 0 5

9 8 7

Also, we can separate the rows by the help of Enter key

>> A = [ 1 0 3

3 0 5

9 8 7]

A(m, n) selects the elements in mth row and nth column. For example

>> A(1, 2)

*Ans* =

4

*Note: There are several built in functions to create matrices.*

**Arithmetic Operations**

|  |  |
| --- | --- |
| Operations | Meanings |
| **+** | Addition |
| **-** | Subtraction |
| **\*** | Multiplication |
| **\** | Left division |
| **/** | Right division |
| **^** | Power |
| **‘** | Transpose |

*Note: In MATLAB A\*A is same as A^2 but tis is different from A.^2. The last gives the square of every numbers.*

The difference between left division (\) and right division(/) is as follows:

1. \ 4 = 2 [It means 8 is divided by 4]

8 / 4 = 0.5000 [It means 4 is divided by 8]

**1. Simplification**

ans =

170>> 4\*(5+3)-3

ans =

29

>> 33\*5+5

**2. Square Root**

>> sqrt (999)

ans =

31.6070

>> sqrt (16)

ans =

4

**3. Power**

>> solve ('9\*x+8')

ans =

-8/9

>> solve ('7\*x-88')

ans =

88/7

**4. Exponential**

>> exp (3)

ans =

20.0855

**5. Simple Trigonometric**

>> sin (20)

ans =

0.9129

>> cos (45)

ans =

0.5253

**LAB 2**

**Matrices and Determinants**

1. **Order of Matrices**

A = [1 9 2; 3 8 4; 5 7 6]

A =

1 9 2

3 8 4

5 7 6

Then, order of matrix will be

>> size (A)

ans =

3 3

2. **Matrix Function**

|  |  |
| --- | --- |
| Eye | Identity |
| Zeros | Matris of zeros or null matrix |
| Ones | Matrix of ones |
| Diag | Create a diagonal matrix |
| Triu | Upper triangular matrix |
| Tril | Lower triangular matrix |

3. **Null Matrix**

zeros (3,3)

ans =

0 0 0

0 0 0

0 0 0

>> zeros (2,2)

ans =

0 0

1. 0

4. **Identity Matrix**

>> eye (3,3)

ans =

1 0 0

0 1 0

0 0 1

>> eye (2,2)

ans =

1 0

0 1

5. **Addtion of Matrix**

>> eye (3,3)

ans =

1 0 0

0 1 0

0 0 1

>> eye (2,2)

ans =

1 0

1. 1

6. **Subtraction of Matrix**

>> A = [ 1 9 2; 3 8 4; 5 6 7];

>>B = [ 5 6 7; 3 8 4; 1 9 2];

>>C = A - B

C =

-4 3 -5

0 0 0

4 -3 5

7. **Multiplication of Matrix**

>> A = [ 1 9 2; 3 8 4; 5 6 7];

>>B = [ 5 6 7; 3 8 4; 1 9 2];

>>C = A \* B

C =

34 96 47

43 118 61

50 141 73

*Note: A\* B and B \* A are not equal.*

8.**Element wise Multiplication of Matrix**

>> A = [ 1 9 2; 3 8 4; 5 6 7];

>>B = [ 5 6 7; 3 8 4; 1 9 2];

>>C = A.\*B

C =

5 54 14

9 64 16

5 54 14

9. **Determinant of Matrix**

>> A = [ 1 9 2; 3 8 4; 5 6 7]

A =

1 9 2

3 8 4

5 6 7

>> det (A)

ans =

-21

10. **Inverse of Matrix**

>> A = [ 1 9 2; 3 8 4; 5 6 7]

A =

1 9 2

3 8 4

5 6 7

>> inv (A)

ans =

-1.5238 2.4286 -0.9524

0.0476 0.1429 -0.0952

1.0476 -1.8571 0.9048

11. **Adjoint of Matrix**

For adjoint of matrix we need to multiply above determinant and inverse of A.

adj (A) = det (A) \* inv (A)

adj =

32.0000 20.0000 -1.0000

2.0000 -22.0000 39.0000

-19.0000 -3.0000 -51.0000

12. **Rank of Matrix**

>> A = [ 1 9 2; 3 8 4; 5 6 7];

>> rank (A)

ans =

3

13. **Matrix Equation**

Let Ax=B be a syetem of equation of matrix form. Then the solution is

X = A\B

For Example:

Solve: x+y+z = 0

3x+9y+z = 81

4x+8y+16z = 64

Here,

>> A = [1 1 1; 3 9 1; 4 8 16];

>> B = [0; 81; 64];

>> X = A\B

X =

-14.5000

13.7500

0.7500

**LAB 3**

**Plotting**

The plot in MATLAB appears in a graphic figure window. MATLAB provide 2-D and 3-D plotting.

1. **2-D Plotting**

Syntax: Plot (x data, y date)

Here, X data is given and y data s obtained by the function y = f (X). Here, X data plot in horizontal axis y data plot in vertical axis.

Some examples are as follows:

Plot the following in MATLAB

1. Y = x^2; x E [-5, 5]

>> x = [-5:0.01:5];

>> y = x.^2;

>> plot (x,y)



b. Y = sinX: x E [-pi,pi]

>> x = [-pi:0.01:pi];

>> y = sin(x);

>> plot (x,y)



2. **3-D Plotting**

Syntax: plot 3(x,y)

Some examples are as follows:

a. y=sinx , z=x+y, x E [-10,10]

x=[-10:0.01:10];

>> y = sin(x);

>> z = x + y;

>> plot3(x,y,z)



b. y=cosx, z=x^2+2y x E [-5,5]

>> x=[-5:0.01:5];

>> y = cos(x);

>> z = x.^2+2\*y;

>> plot3(x,y,z)



3. **Conic Section**

a. Circle

Plot the following function in MATLAB.

X^2+Y^2 = 4

Here the general equation of circle is x^2+y^2 = r^2

Thus, center will be zero and radius will be 2

i.e. r=2, centre (0,0) = centre (h,k)

>> r=2;

>> h=0;

>> k=0;

>> theta=-pi:0.01:pi;

>> x=h+r\*cos(theta);

>> y=k+r\*sin(theta);

>> plot(x,y)

Enter,



b. Eclipse

Plot the ellipse x^2/16+y^2/9=1 in MATLAB

Comparing the given equation with x^2/a^2 +y^2/b^2 =1,

We get a=4, b=3

Now,

>> a=4;

>> b=3;

>> theta=-pi:0.01:pi;

>> x=a\*cos(theta);

>> y=b\*sin(theta);

>> plot(x,y)

Enter,



**LAB 4**

A. BASIC CONCEPT OF VECTOR

=1 +2+3

In row

>> v=[1 2 3]

v =

1 2 3

In column

>> v=[1;2;3]

v =

1

2

3

B. NORM AND UNIT VECTOR

Find the norm and unit vector of given vector

* A=5 -2 +3

In MATLAB program

To find the norm

>> A=[5 2 3];

>> norm(A)

ans =

6.1644

Now find a unit vector of A

>> A/norm(A)

ans =

0.8111 0.3244 0.4867

* A=3 +4 +7 k

To find the norm

>> A=[3 4 7];

>> norm(A)

ans =

8.6023

Now , find the unit vector of A

>> A/norm(A)

ans =

0.3487 0.4650 0.8137

C. COMMAND

|  |  |
| --- | --- |
| Dot(a,b) | Dot product of a and b |
| Cross(a,b) | Cross product of a and b |
| Dot(a, cross (b,c)) | Scalar triple product of a,b,b |
| Cross(a, cross (a,b)) | Vector product of a,b,b |

D. DOT (SCALAR) PRODUCT

Find the scalar product of given vector

* A=3 +4 +7

B=2 + 6 +7

Now find the scalar product of above

>> A=[3 4 7];

>> B=[2 6 8];

>> dot(A,B)

ans =

86

* A=5 +7 +8
* B=2 + +3+9

HERE,

>> A=[5 7 8];

>> B=[2 3 9];

>> dot(A,B)

ans =

103

E, CROSS (VECTOR) PRODUCT

Find the cross product of following

A=5 +7 +8

B=2 + +3+9

To find the cross product of above vector in MATLAB program

>> A=[5 7 8];

>> B=[2 3 9];

>> cross(A,B)

ans =

39 -29 1

* Find [ ] and \*( )

=3 + + = + + , =2 -

Solution

Using matlab

find [ ]

>> a=[3 1 1]

a =

3 1 1

>> b=[1 1 1]

b =

1 1 1

>> c=[0 2 -3]

c =

0 2 -3

>> dot(a, cross(b, c))

ans =

-10

Again to find \*( )

>> a=[3 1 1]

a =

3 1 1

>> b=[1 1 1]

b =

1 1 1

>> c=[0 2 -3]

c =

0 2 -3

>> cross(a, cross(b,c))

ans =

-1 -11 14

Thank You