وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الشمالية

كلية تقنية كركوك
هندسة البيئة والتلوث

الحقيبة الدراسية

- المادة الدراسية / Matlab
- عدد الساعات / (١) نظري +(٢) عملي
- لغة التدريس / الانكليزية .
- طبيعة المادة / سنوية .
- عدد الاسابيع / (30) اسبوع .
- الفئة المستهدفة / طلبة المرحلة الثالثة.

اهداف المادة: في نهاية الدورة يكون الطالب قادرا على:

١- تحديد استخدام البرامج الحسابية لكتابة البرنامج الأساسي.

٢-توظيف برنامج كمبيوتر لحل مشكلة الطريقة العددية

٣- تحديد كفاءة إنشاء برنامج حاسوبي لحل مسائل المعادلات التفاضلية العادية والمعادلات التفاضلية الجزئية والتحسين.

- الوحدت النمطية / (كل وحدة نمطية تمثل مفردة اسبوع دراسي واحد) .
- المدرس القائم بالتدريس / م.م سري عبدالرزاق صالح

Chemistry

Week No.	Items Detail
1 , 2	**Introduction** Environment of MATLAB
3 , 4	**Arithmetic Expressions** Mathematical functions, Logical Operators, Relational Operators.
5 , 6	**Vectors and Matrices** Matrix operations , transpose and inverse of matrix.
7 , 8	Working with polynomials (manipulating polynomials, derivatives roots, eigen values)
9 , 10 , 11	Solve System of Linear Equations by **Gauss Elimination Method** **M–File** Create M-file, function calling in MATLAB
12 , 13	Programming with MATTAB, Use of Built-in Functions, Input Output, Structured Programming, Nesting and Indentation
14 , 15	**Graphic Plot** Graphics two-dimensions plots, Log-log and semi-log plots, Histograms plots.

	Linear Regression, Curve fitting techniques
16 , 17	**Conditions and Loops Statements** Functions in MATLAB if, else, else if, while, for, switch, break Loop function: for-next ,…do-while…end
18 , 19 , 20	Roots Finding of Nonlinear Equations : Bisection ,Regula-false methods, Newton Raphson method
21 , 22	Numerical Integration by Trapezoidal Rule, Simpson's Rule
23 , 24	**Applications** One and Two dimension Intropolation by algebraic polynomials Roots Finding of Nonlinear Equations : Bisection ,Regula-false methods, Newton Raphson method
25 , 26	Numerical Integration by Trapezoidal Rule, Simpson's Rule Numerical Solutions of ODEs using Euler Method, Modified Euler Method , Runge Kutta Method
27 , 28	Calculate the Laplace Transform and Inverse Laplace Transform
29 , 30	What is the Optimization Toolbox?, Unconstrained and constrained Optimization , Multi-objective optimization, Large scale Algorithms

- MATLAB: It is a very useful engineering program especially in the analysis and design of electronic and industrial systems and simulation using the computer. The word Matt Lab came from the initials of the term (Matrix Laboratory). It includes a huge library of tools used in many fields such as signal processing, image processing, robotics, and more.

- Definition of program designers

The program was designed by two people: Cliff Muller, a professor of mathematics, and Jack Little, a computer science professor with a bachelor's degree in electrical engineering for over 20 years at Michigan University, Stanford University and the University of New Mexico.
they spend five years in the (Intel Hypercube organization) and (Ardent computer) factories before moving to the parent company of the MATLAB program.

- Matt Lab Applications
  - Using in Control System.
  - Using Digital Signal Processing.
  - Using in Mechanical Applications
  - Using in Radar Applications
  - Using in Electronics Applications
  - Using in Automotive Applications.
  - Using in Communication Applications.

- properties

1- MATLAB platform is designed to solve engineering and scientific problems in an easy way for the user

2- Matrix-based MATLAB is the best way to express computational mathematics

3- Integrated graphics make it easy to visualize and gain insights from the data.

4- An extensive library of pre-integrated toolboxes that allows you to immediately start using the necessary algorithms for your domain.

5- Desktop contains tools for quick access. Easier for the user

6-MATLAB tools and capabilities are all thoroughly tested and designed to work together.

7- MATLAB helps you take your ideas off your desktop

8- You can analyze a large, large-scale data set.

9- MATLAB codes can be integrated with other languages, allowing you to deploy algorithms and applications within web, enterprise and production systems.

- Configure the program
  1- The language: Matlab This is a high-level language for arrays.
  2- MATLAB Work Environment: Includes MATLAB users or programmers and also includes tools for development, management and applications of MATLAB.
  3- Graphics: Matlab includes high-level commands for 2D and 3D data visualization, and image processing.
  4- Matlab Library: A wide range of mathematical functions such as (sin,log….)
  5- The possibility of linking Matlab with programming languages such as C and Java.

- When you start MATLAB, the desktop appears in its default layout. shown fig (1)

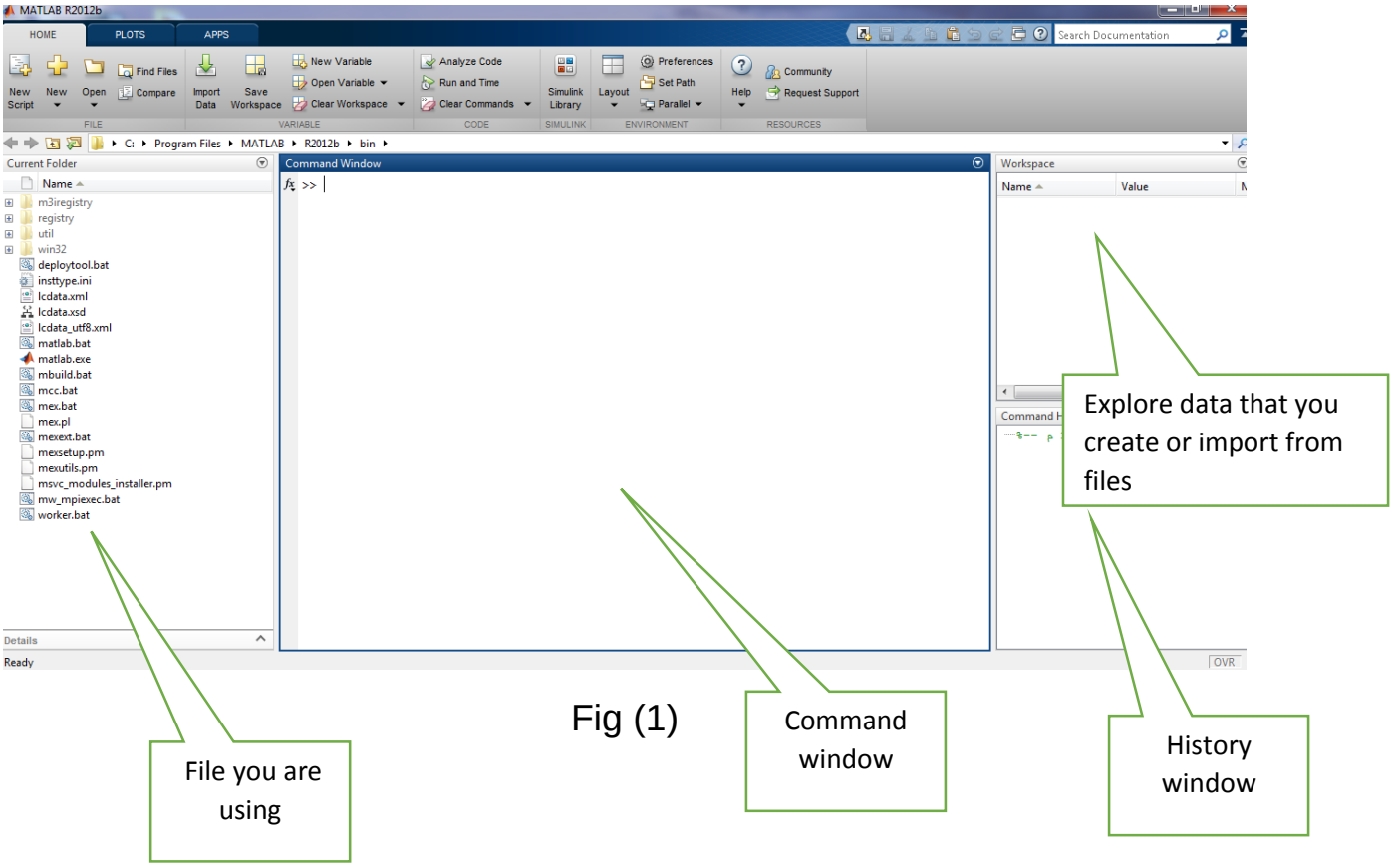


Fig (1)

- <u>command window</u>
  The main window of the program where the instructions are written directly. It has several functions:-
  1- View the help texts included with the functions provided by the program or general assistance.
  2- View results.
  3- See the work path and change it programmatically.
  4- View the contents of the work field and the value of the variables and delete them as necessary.
  5- Open subsections of the program such as (Simulink.. , demo).

- WorkSpace window

  In this window, the names of the variables declared and their values are shown.

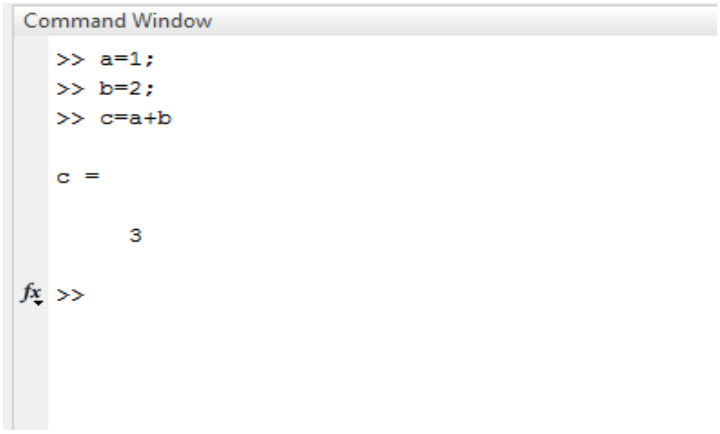
It benefits from avoiding the return of the same values for the variable and when you close the program is erased data, as well as data is deleted programmatically using clear.

- History window
  In this window registration all orders executed at in time and date
  One of its benefits is to facilitate the reactivation of the command using the arrow keys on the keyboard.

** Using command window

- To insert notes in window command can use (%)

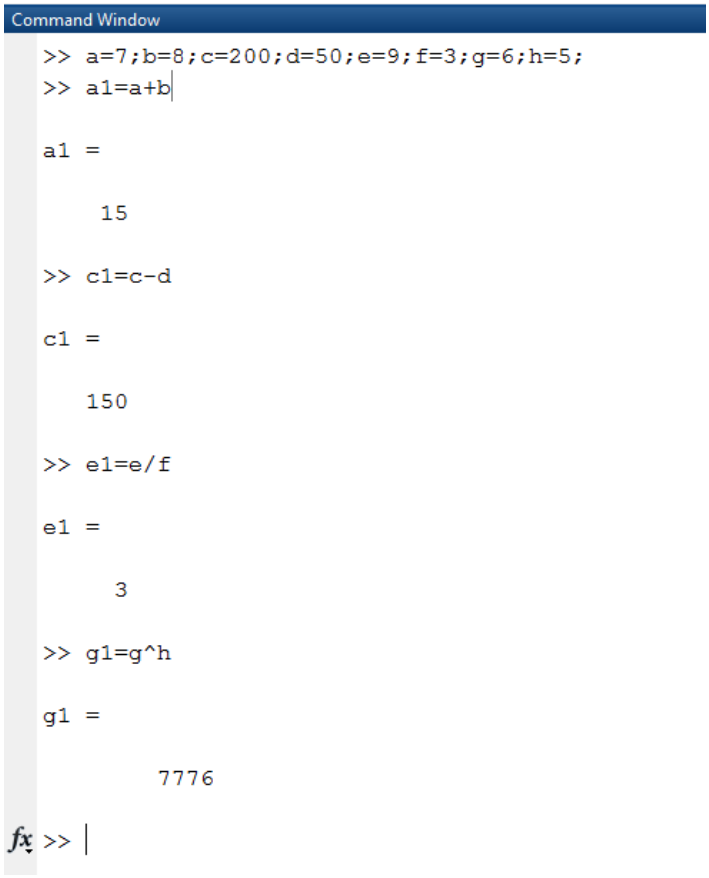
- Mathematical functions.
  Ex1\ find summation 1+2 ? Shown fig (2)



Fig(2)

- Important Command
  1- CLC: clear window command just without delete
  2- Clear: delete all data in window command

EX2\find(8*7, 200-50 , 9/3 ,6^5) ?shown fig(3)



Fig(3)

- Another method to write command in fig (4)

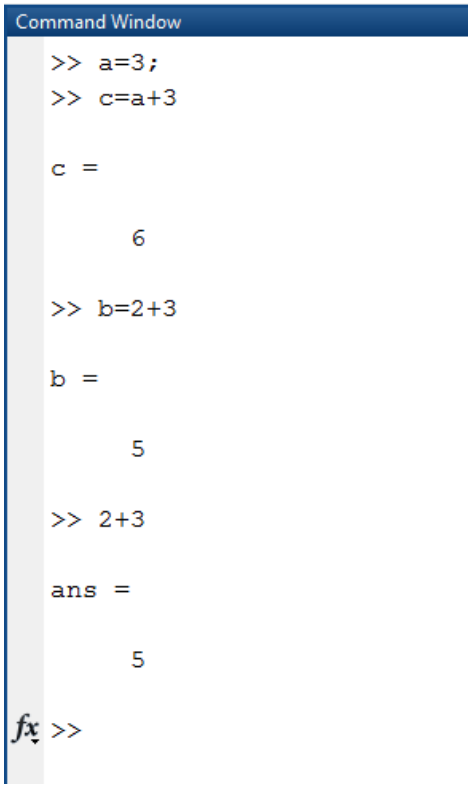
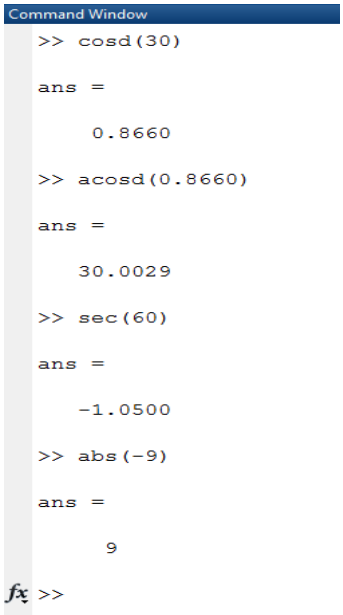


Fig (4)

EX3\ find cos(30), $\cos^{-1}$ (0.8660), sec(60),abs -9?shown fig(5)



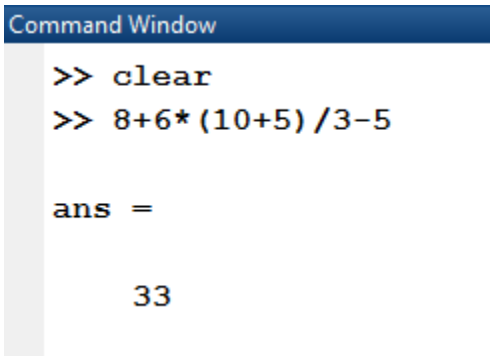
Fig(5)

- Priority in calculations shown fig(6). Start from left to right

( )	1
^	2
*	3
/	4
+	5
-	6

Fig(6)

Ex4\ find 8+6*(10+5)/3-5 ? shown fig(7)



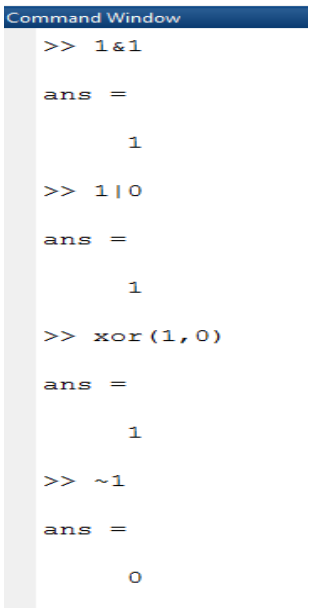
Fig(7)

- Logical Operators: shown table 1

Table1

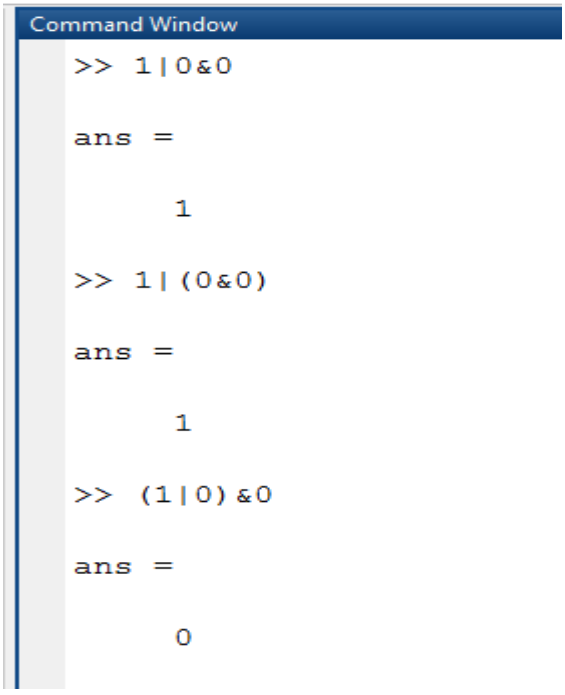
Inputs		and	or	xor	not
A	B	A&B	A|B	xor(A,B)	~A
0	0	0	0	0	1
0	1	0	1	1	1
1	0	0	1	1	0
1	1	1	1	0	0

Ex5\find (1and1),(1or 0), (0 xor 0),(1 not)?shown fig (8)



Fig(8)

EX6\find (1 or 0 and 0)?shown fig(9)



Fig(9)

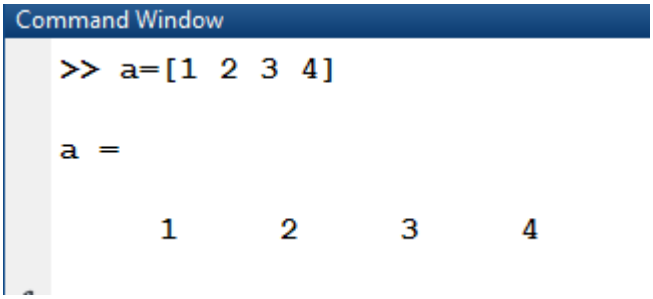
- Relation Operators. Shown table(2)

Table2

A<B	B is bigger	
A>B	A is bigger	
A<=B	B bigger or equal A	
A>=B	A bigger or equal B	
A==B	A equal B	
A~=B	A not equal B	

- Matrices and Arrays: which viewer data as rows and columns.

Ex7\ a= 1,2,3,4 .find arrays 1*4.shown fig(10)



Fig(10)

EX8\ create a matrix 3*3, a=[1 2 3;4 5 6;7 8 9]shown fig(11)

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

a =

     1     2     3
     4     5     6
     7     8     9
```

Fig(11)

- Another way to create a matrix,(zeros, ones, rand)

Ex9\ create a 5-by-1 column vector of zeros. Shown fig (12)

Random

Command Window

```
>> z = zeros(5,1)

z =

     0
     0
     0
     0
     0
```

```
>> z = ones(5,1)

z =

     1
     1
     1
     1
     1
```

```
>> z = rand(5,1)

z =

    0.8147
    0.9058
    0.1270
    0.9134
    0.6324
```

Fig (12)

- Matrix and Array Operations

EX10\ summation

Command Window

```
>> a=5;b=[1 2 3; 4 5 6;7 8 9];
>> a+b

ans =

     6     7     8
     9    10    11
    12    13    14
```

Fig (13)

EX11\ transpose a matrix. Fig (14)

```
>> c

c =

     6     7     8
     9    10    11
    12    13    14

>> c'

ans =

     6     9    12
     7    10    13
     8    11    14
```

Change columns and rows palace

Fig(14)

EX12\ Multiplication a*a , a.a ,a=[1 2 3;4 5 6;7 8 9],fig(15)

```
Command Window
>> a=[1 2 3;4 5 6;7 8 9];
>> a.*a

ans =

     1     4     9
    16    25    36
    49    64    81

>> a*a

ans =

    30    36    42
    66    81    96
   102   126   150
```

Dot multiplication

Fig(15)

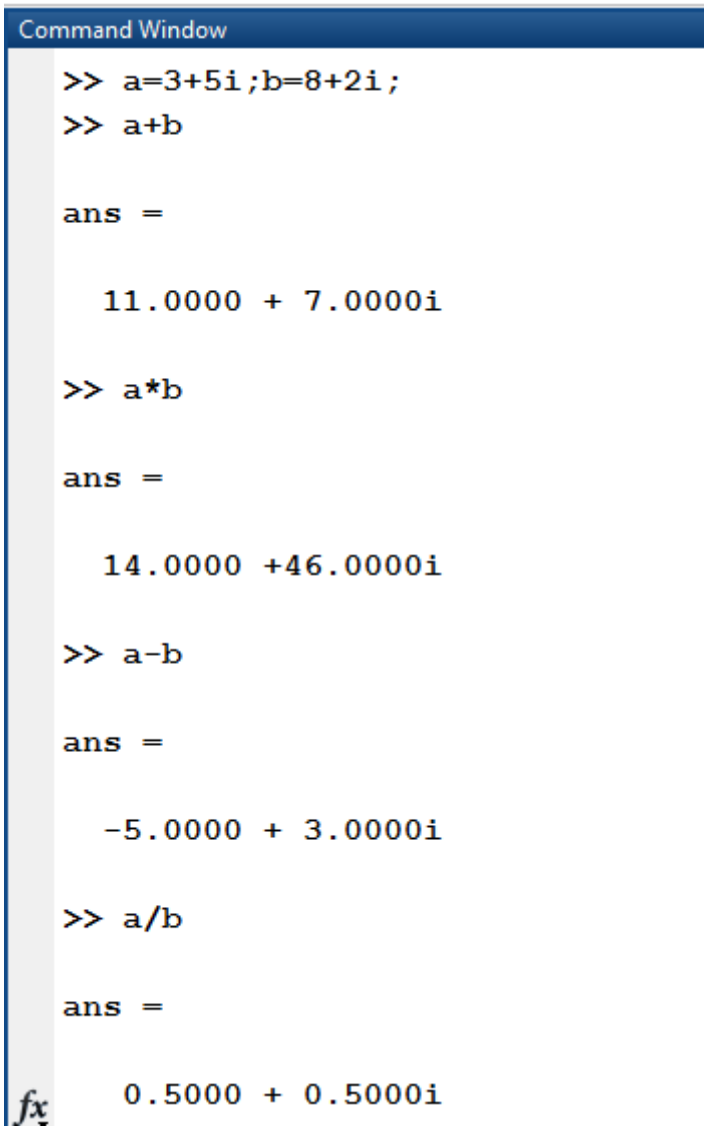
Ex13\ find determine matrix [1 2 3; 4 5 6;7 8 9]

```
Command Window
>> a=[1 2 3;4 5 6;7 8 9];
>> det(a)

ans =

   6.6613e-16
```

Fig (16)

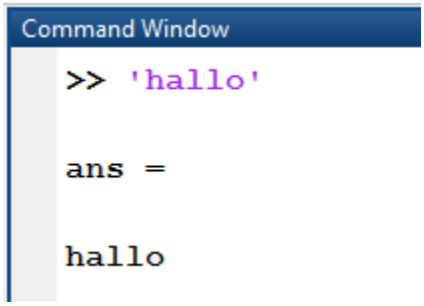
- Real& imaginer

Ex14\ a=3+5i,b=8+2i,find [a+b , a*b , a-b , a/b]



- Insert text

Ex 1\ Insert ’ hallo’.fig(1)



Fig(1)

Ex2\ insert text with number .fig(2)

```
>> f = 71;
c = (f-32)/1.8;
tempText = ['Temperature is ',num2str(c),'C']

tempText =

Temperature is 21.6667C
```

Fig(2)

- Polynomials

Ex3\ represent c= X^4 -$3x^2$+2 .

```
>> c=[1,0,-3,0,2]

c =

     1     0    -3     0     2
```

Fig(3)

Ex4\ find b(x)=x^2 +5x+3,if x=5.

```
>> x=5;
>> b=x^2 +5*x+3

b =

    53
```

Fig(4)

- Polynomials roots

Ex5\ find roots c(x)= x^2 -5

```
>> c=[1,0,-25];
>> roots (c)

ans =

     5
    -5
```

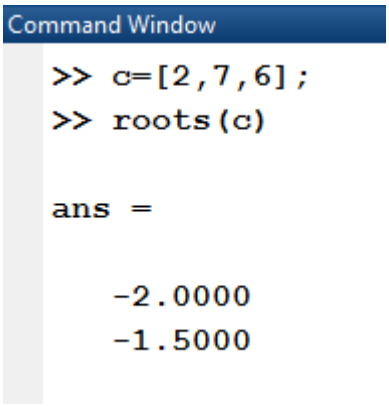
Fig(5)

Ex6\ find roots b(x) =x^2 -5x +6

```
>> b=[1,5,6];
>> roots(b)

ans =

   -3.0000
   -2.0000
```

Fig(6)

Ex7\find roots c(x)=$2x^2$+7x+6



Fig(7)

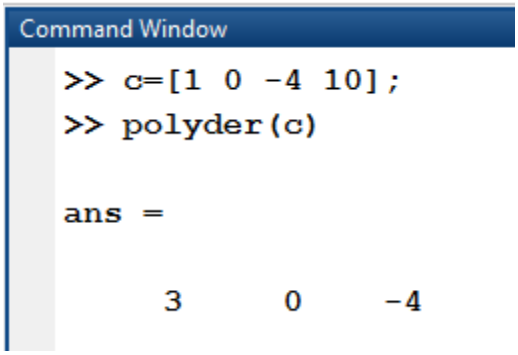
Ex 8\find roots b(x) =$4x^2$ -24x+35.(destor)

```
>> b=[4,-24,35];
>> roots(b)

ans =

    3.5000
    2.5000
```

fig(8)

- polynomials derivatives

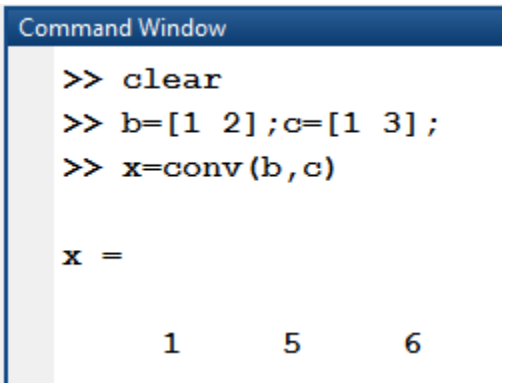
  Ex9\find derivative c(x)=x^3 -4x+10



Fig(9)

- polynomials multiplication

EX10\ find convolution c(x)=x+3, b(x)= x+2



Fig(10)

Ex11\ find convolution c(x)=x^2 -2x+10, b(x)=$2x^2$+4x+7

```
>> b=[2,4,7];c=[1,-2,10];
>> x=conv(b,c)

x =

     2     0    19    26    70
```

Fig(11)

- Polynomials division

Ex12\divide two Polynomials c(x)=$3x^2$-2x+4 b(x)=x^2+7 .

```
>> c=[3,-2,4];b=[1,0,7];
>> [c,b]=deconv(c,b)

c =

     3


b =

     0    -2   -17
```

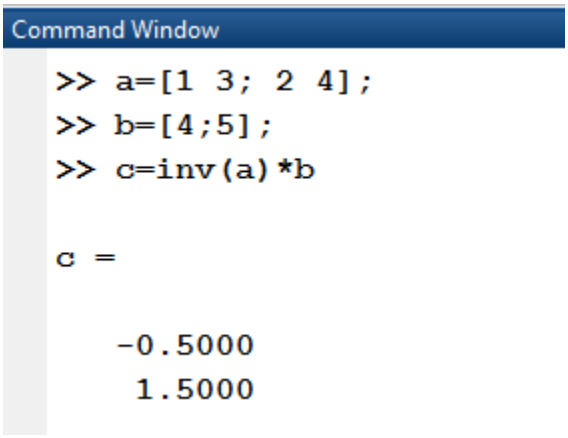
Fig(12)

- Solve liner equation in Matlab

EX13\Find x,y if

x+3y=4

2x+4y=5



Fig(13)

Ex14\ Find x,y,z .if
3y+2x+z=11
x+3y+z=10
2x+7z+5y=33

```
>> a=[3 2 1; 1 3 1;2 5 7];
>> b=[11;10;33];
>> c=inv(a)*b

c =

    1.4324
    1.8649
    2.9730
```

Fig(14)

- Eigenvalue

Ex15\Find Eigenvalue if matrix is

$$A=\begin{matrix}2 & 0 & 1\\ -1 & 4 & -1\\ -1 & 2 & 0\end{matrix}$$

```
Command Window
>> clear
>> a=[2 0 1;-1 4 -1;-1 2 0];
>> lambda = eig(a)

lambda =

    3.0000
    2.0000
    1.0000
```

Fig(15)

- Gauss Elimination

EX16\Find x,y .using Gauss Elimination ,if

x+3y=4

2x+4y=5

```
>> a=[1 3;2 4];
>> b=[4;5];
>> a\b

ans =

   -0.5000
    1.5000
```

Fig(16)

EX17\ Find x,y,z . using Gauss Elimination ,if
3y+2x+z=11
x+3y+z=10
2x+7z+5y=33
2x+y+z=7

```
>> a=[3 2 1;1 3 1;2 5 7; 2 1 1];
>> b=[11;10;33;7];
>> a\b

ans =

    1.2683
    1.9712
    2.9387
```

Fig(17)

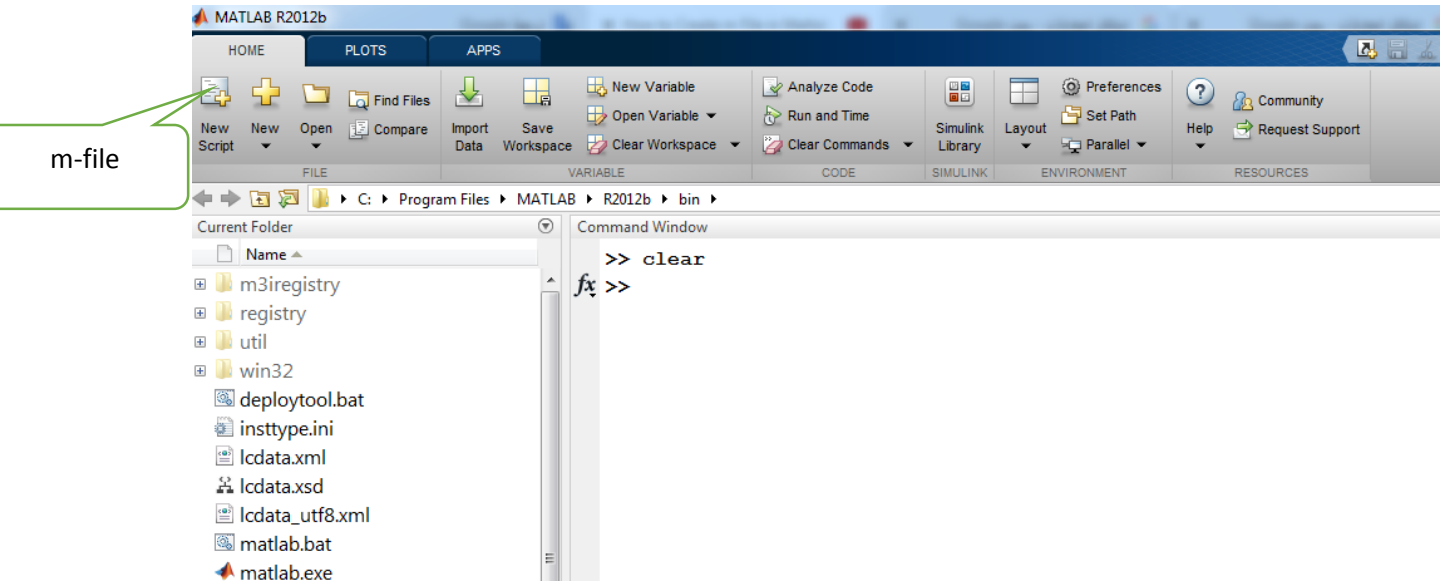
- Great M-file in Matlab .shown fig(1)

M-file: It is a code prepared previously perform various functions and each function has its own name does not resemble others. There are two types of functions :

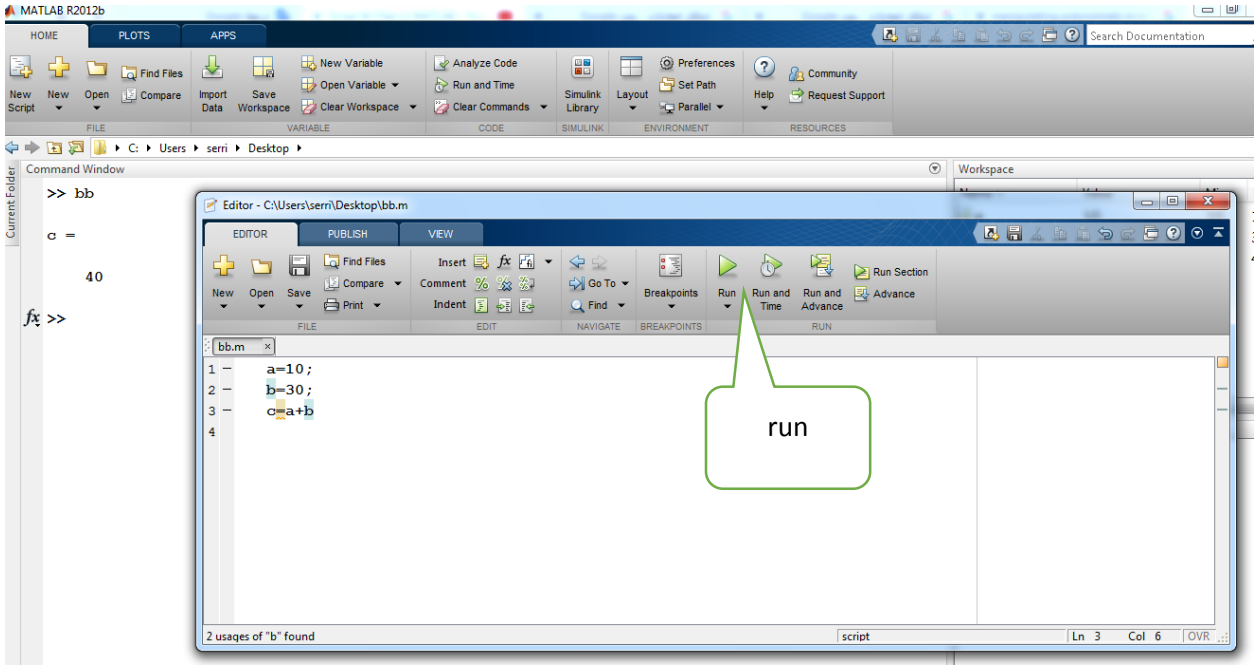
1- Functions that are written by ourselves and stored with a specific name for later use. But the following should be considered:

- The function name in the function definition is the same as the function is saved.
- The function name is composed of a single section that is not separated by a space.
- The name must not exceed 31 characters.
- The function name starts with a letter and can be followed by a symbol.
  If needed the function can call it by typing its name or playing it directly from Run in the file screen.

2- The second type is functions stored in the MATLAB program and are prepared by the software manufacturer.We can use it directly without having to know the code in it

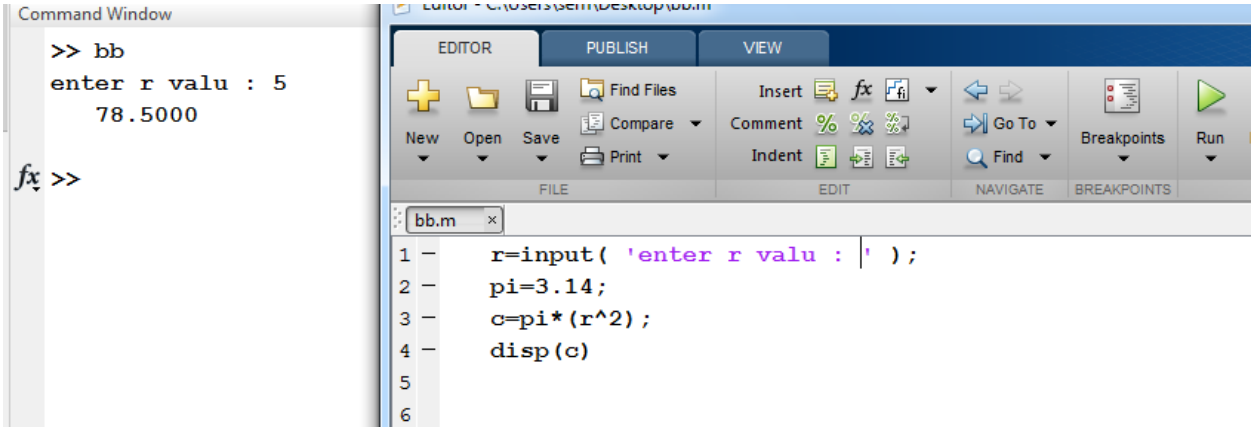


Fig(1)



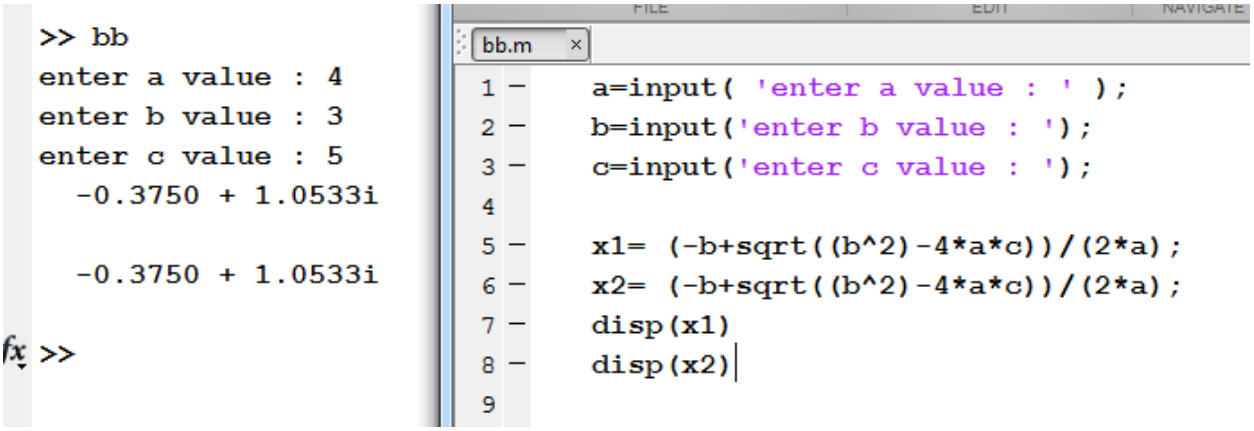
Fig(2) window editer

Ex1\find circle area =pi*r^2 .by use m-file.fig(3)



Fig(3)

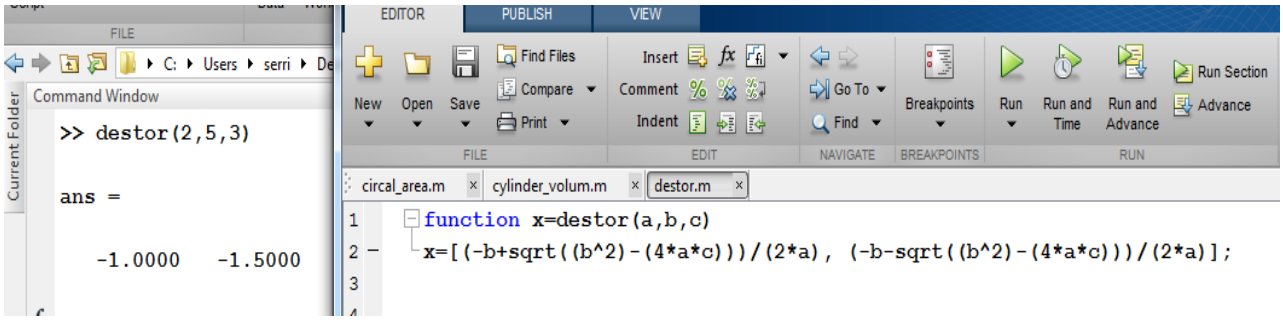
Ex2\find x=$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$ .use m-file.fig(4)



Fig(4)

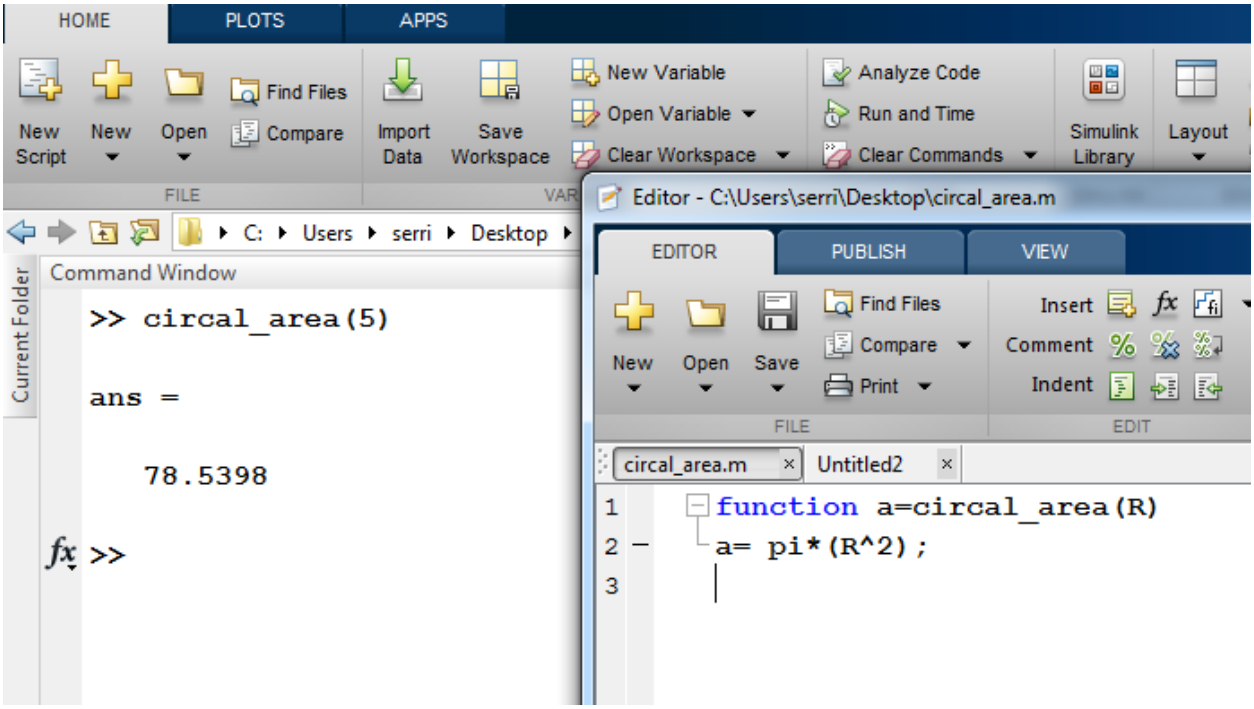
- Great function

Ex3\find x=$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$ .using function.shown fig(5)



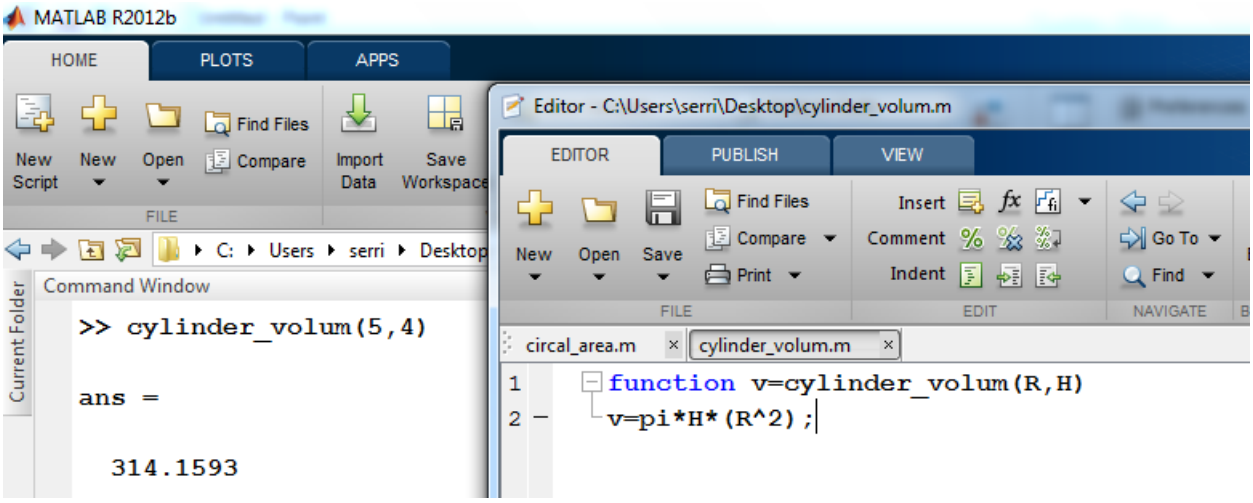
Fig(5)

Ex4\find circle area .using function . shown fig(6)



Fig(6)

Ex5\find cylinder volum .using function. shown fig(7)

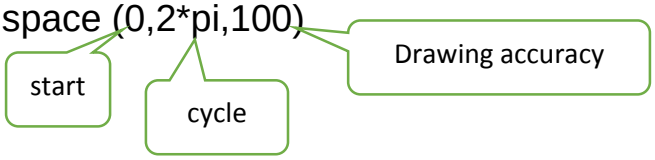


Fig(7)

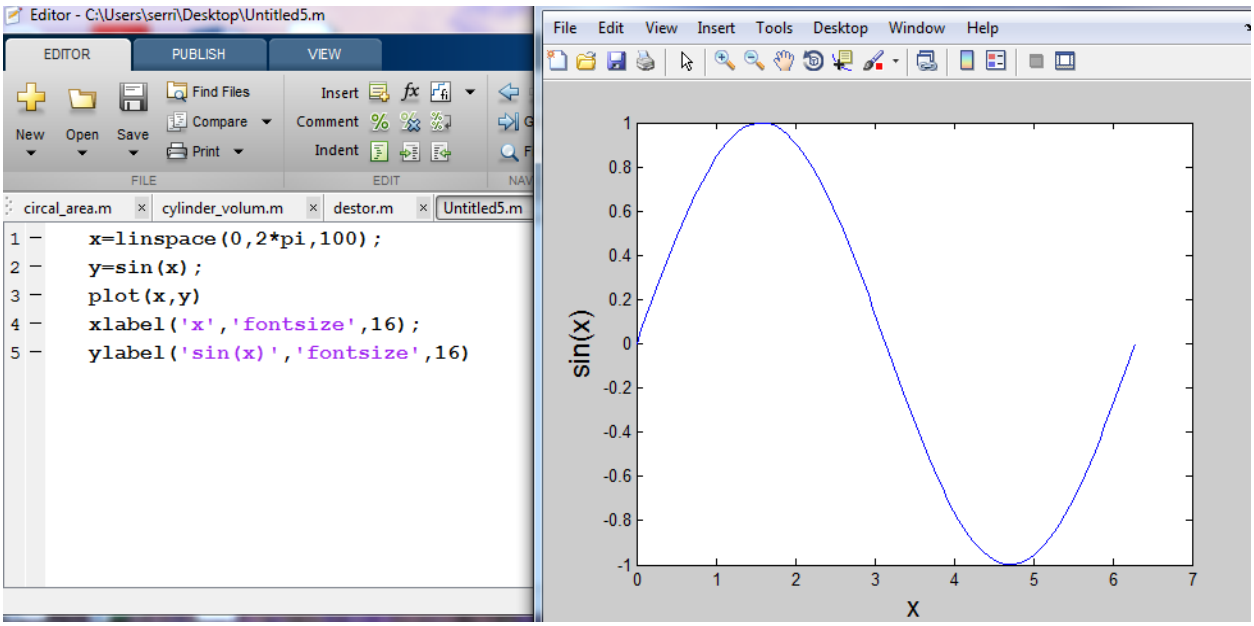
- Graphic plot

Matlab has a great ability to display vectors, arrays and functions as graphs, It can also draw three-dimensional shapes in addition to moving these graphical shapes and this in addition to the possibility of inserting any text comments and change the colour of the line and label axes and label variables

- Linspace (0,2*pi,100)

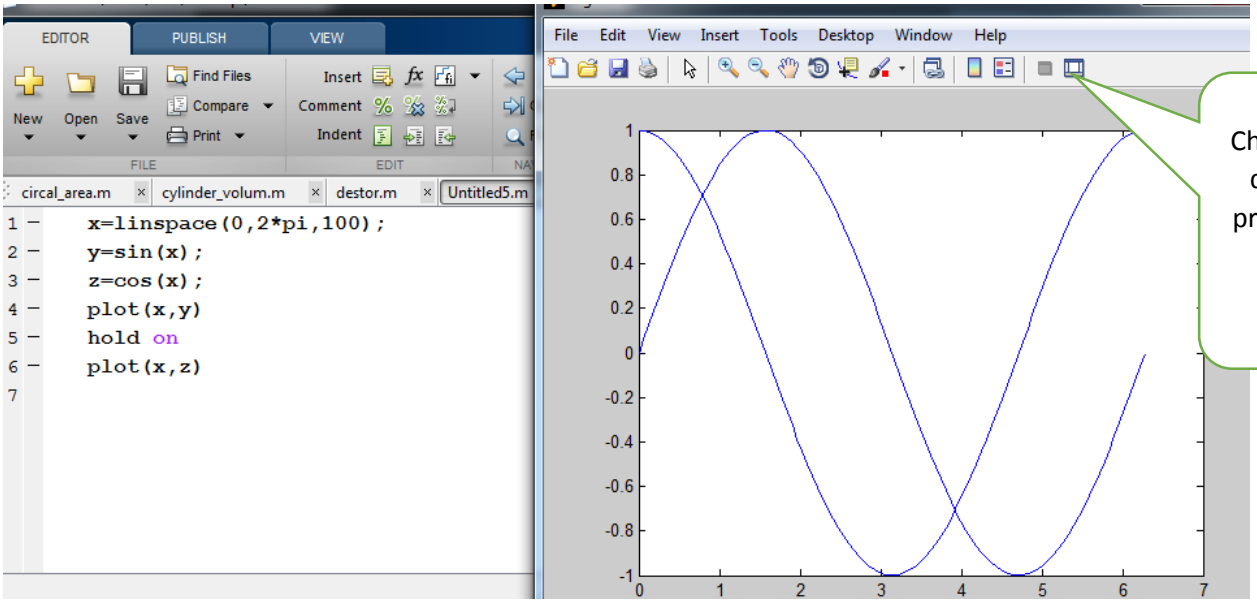


Ex6\ find graphic two-dimension for sin(x). shown fig(8)

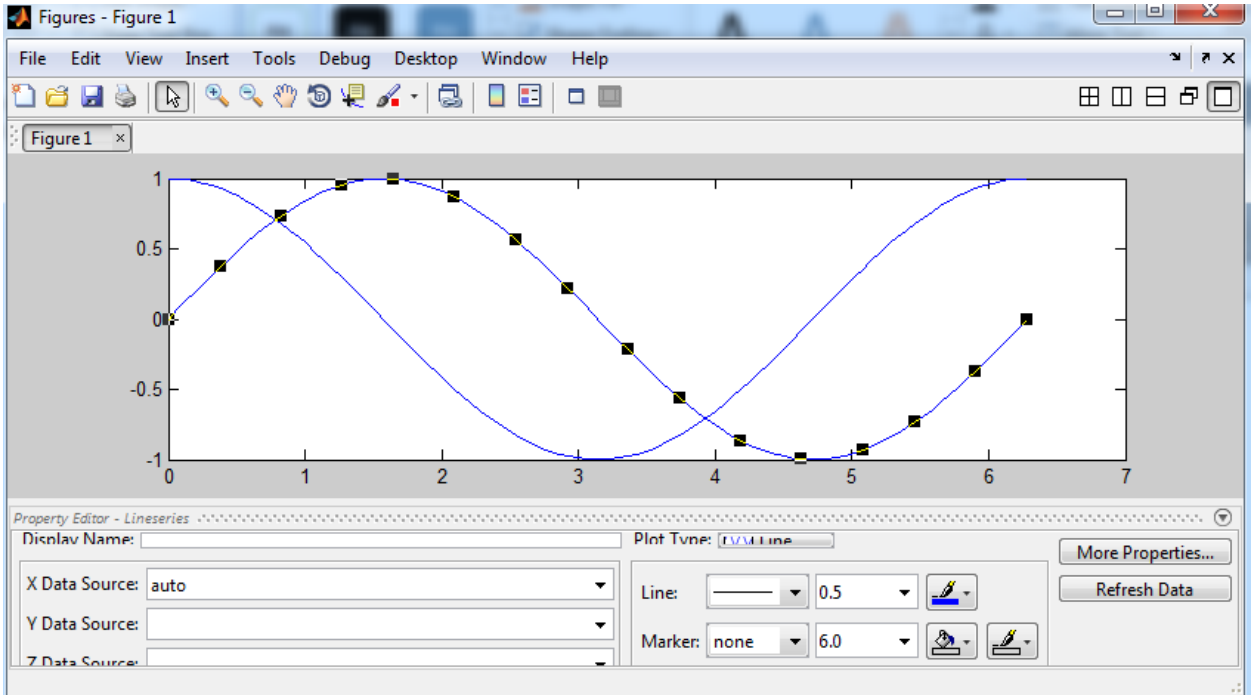


Fig(8)

Ex7\ find graphic two-dimension for sin(x),cos(x) togather. shown fig(9-10)

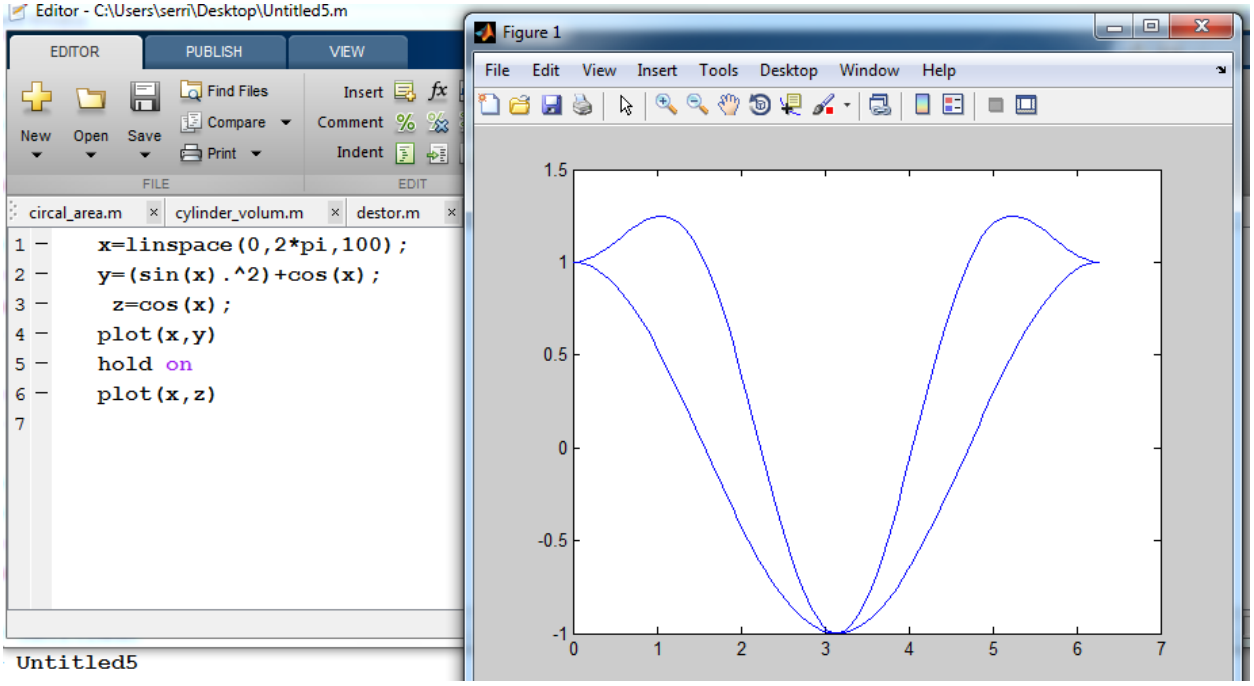


Fig(9)



Fig(10)

Ex8\ find graphic two-dimension for $\sin^2(x)+\cos(x)$,cos(x) togather. shown fig(11)



Fig(11)

- Ploting log-log &semi log
- linspace(0,100,1000)

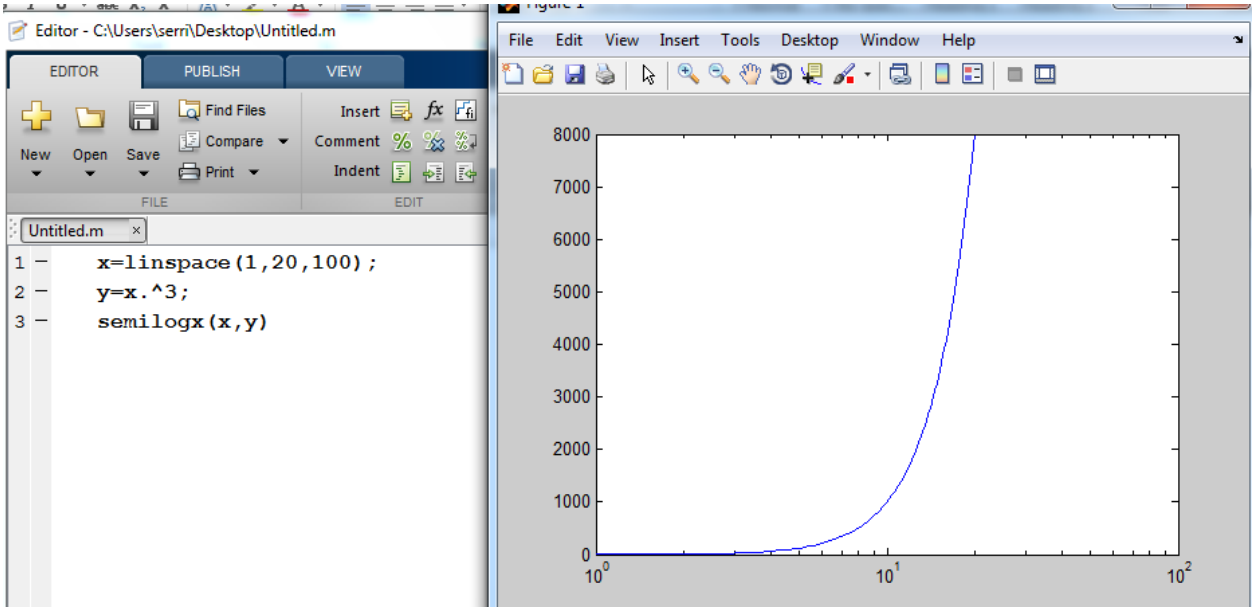
Start

Staging on the horizontal

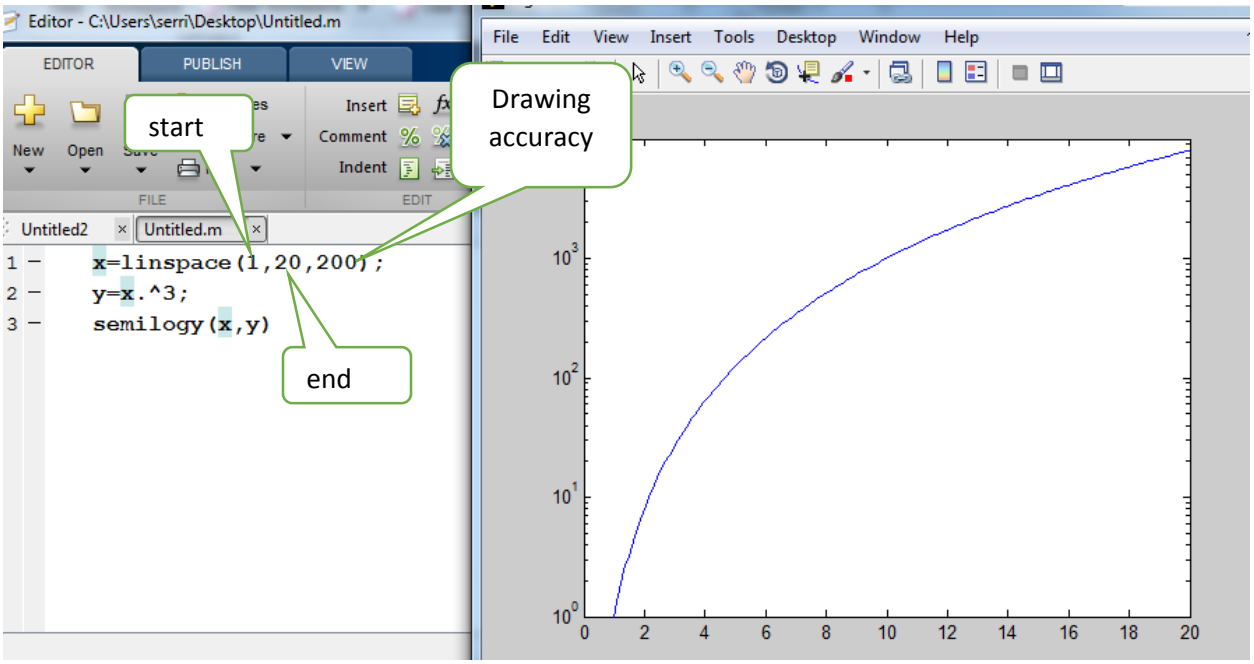
end

- semilogx (x,y): The graphic is toward the horizontal axis.
- semilogy(x,y): The graphic is towards the vertical axis.

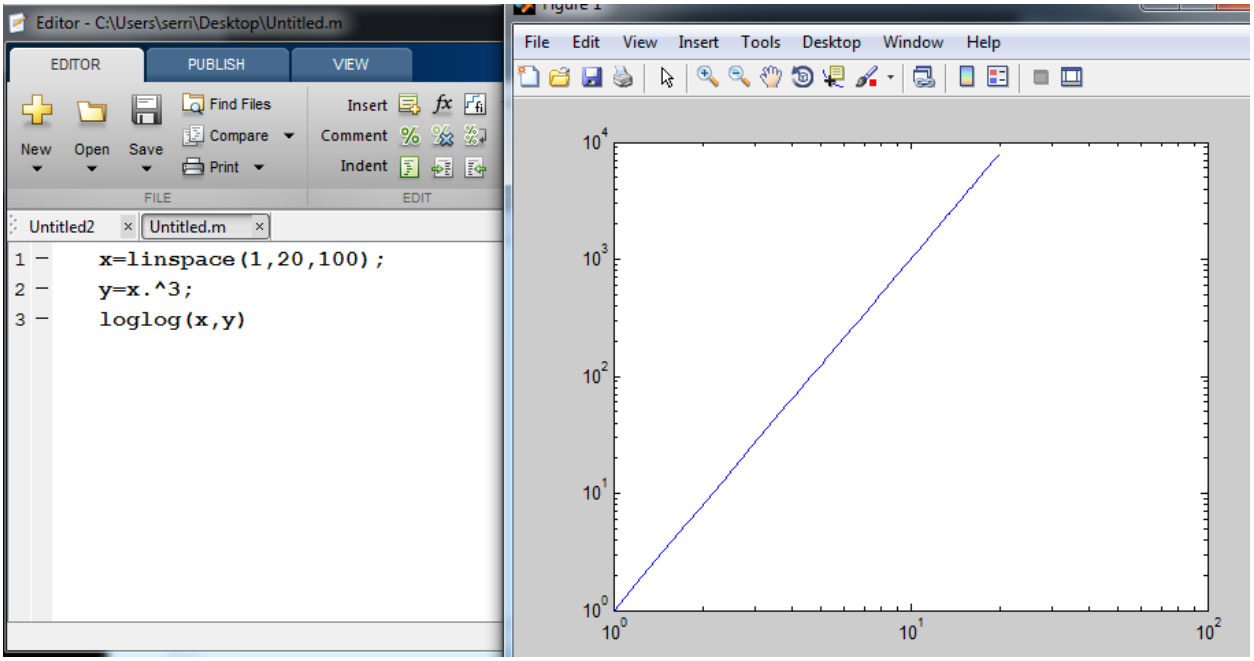
Ex9\plot X^3 toward the horizontal axis& vertical axis. Using semilog & log-log. shown fig(13-14-15)



Fig(12)


Editor - C:\Users\serri\Desktop\Untitled.m
EDITOR
PUBLISH
VIEW
New
Open
Insert
Comment
Indent
FILE
EDIT
Untitled2
Untitled.m
1 x=linspace(1,20,200);
2 y=x.^3;
3 semilogy(x,y)
start
end
Drawing accuracy
File Edit View Insert Tools Desktop Window Help
10^3
10^2
10^1
10^0
0 2 4 6 8 10 12 14 16 18 20

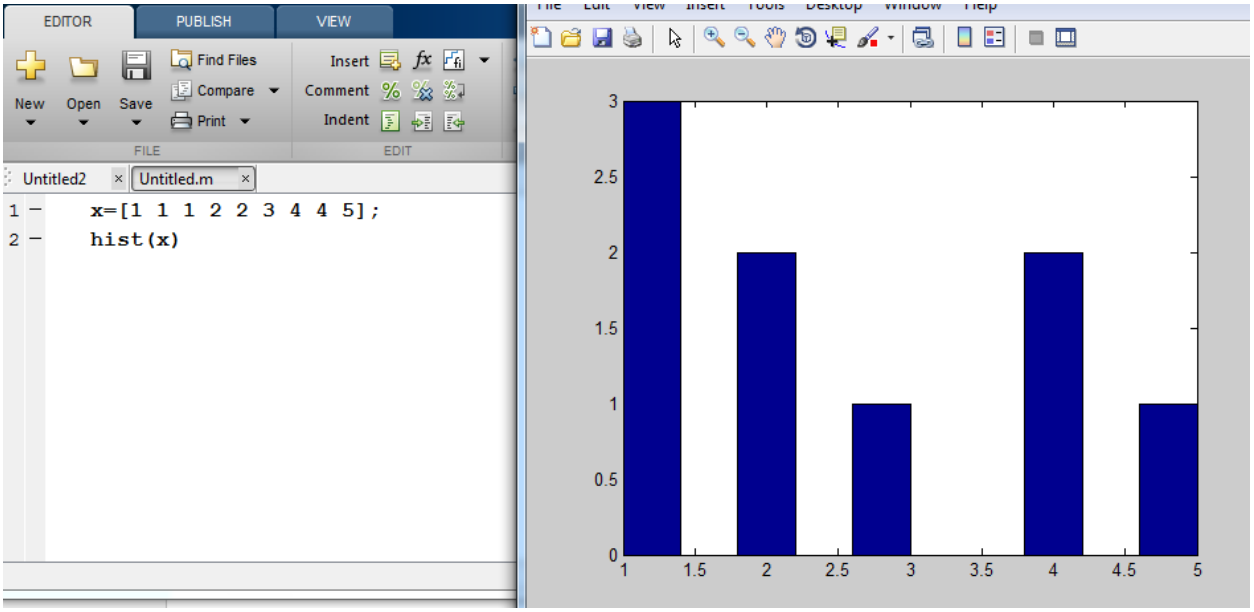
Fig(13)


Editor - C:\Users\serri\Desktop\Untitled.m
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
Insert
Comment
Indent
FILE
EDIT
Untitled2
Untitled.m
1 x=linspace(1,20,100);
2 y=x.^3;
3 loglog(x,y)
File Edit View Insert Tools Desktop Window Help
10^4
10^3
10^2
10^1
10^0
10^0 10^1 10^2

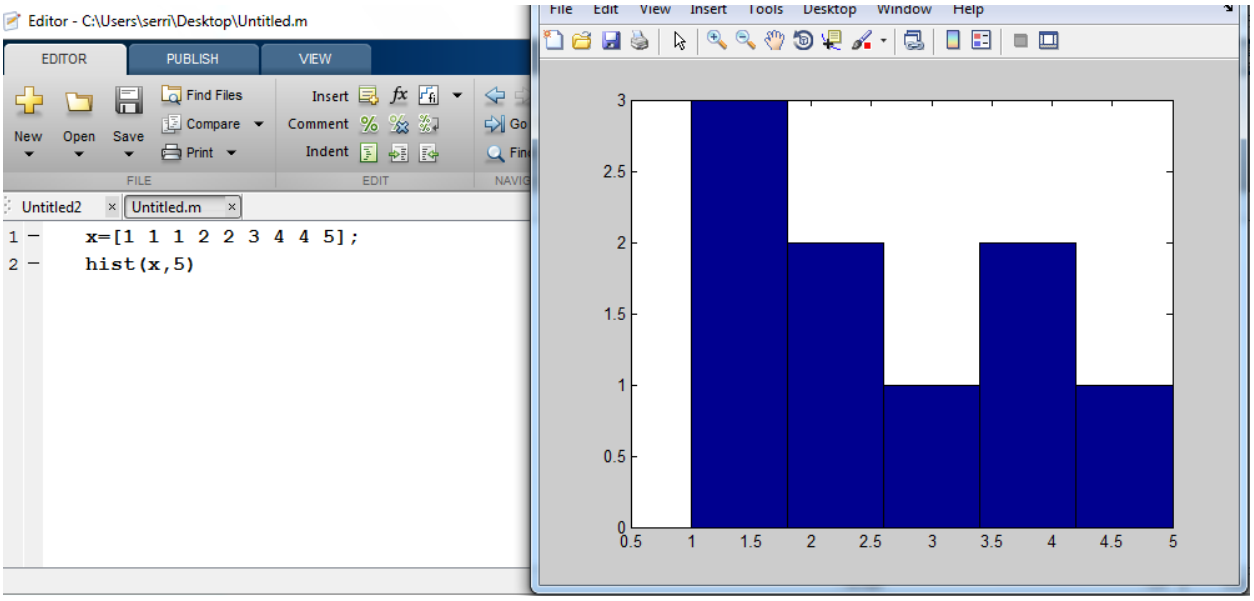
Fig(14)

- Histograms plots

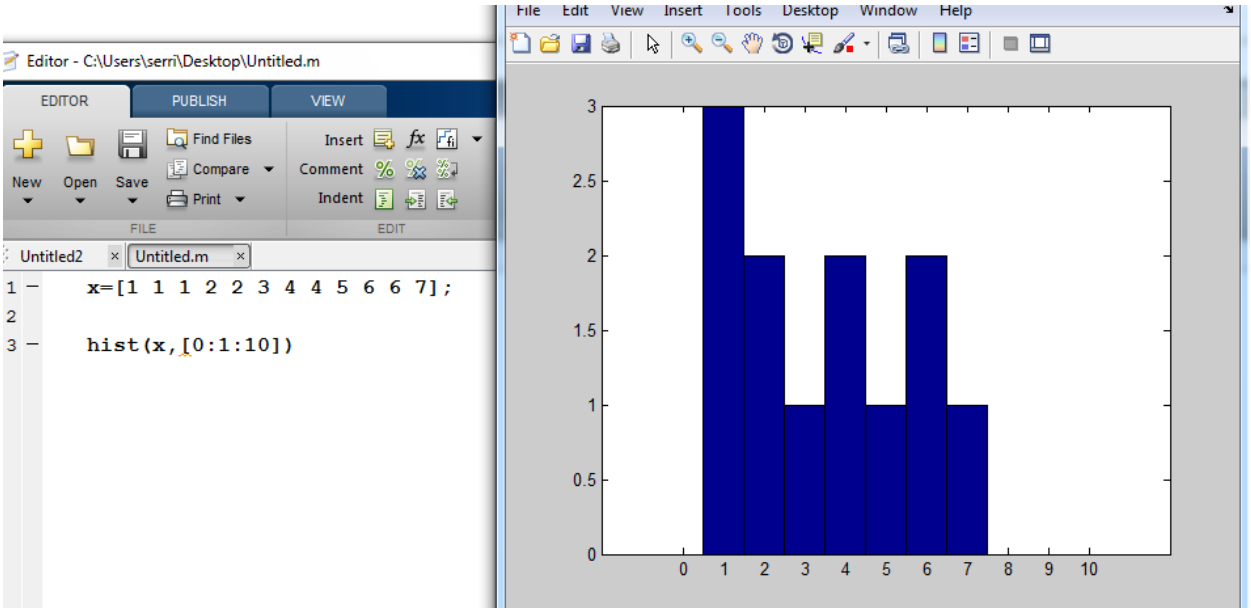
EX10\ [1 1 1 2 2 3 4 4 5].in histograms. shown fig(15-16-17)



Fig(15)

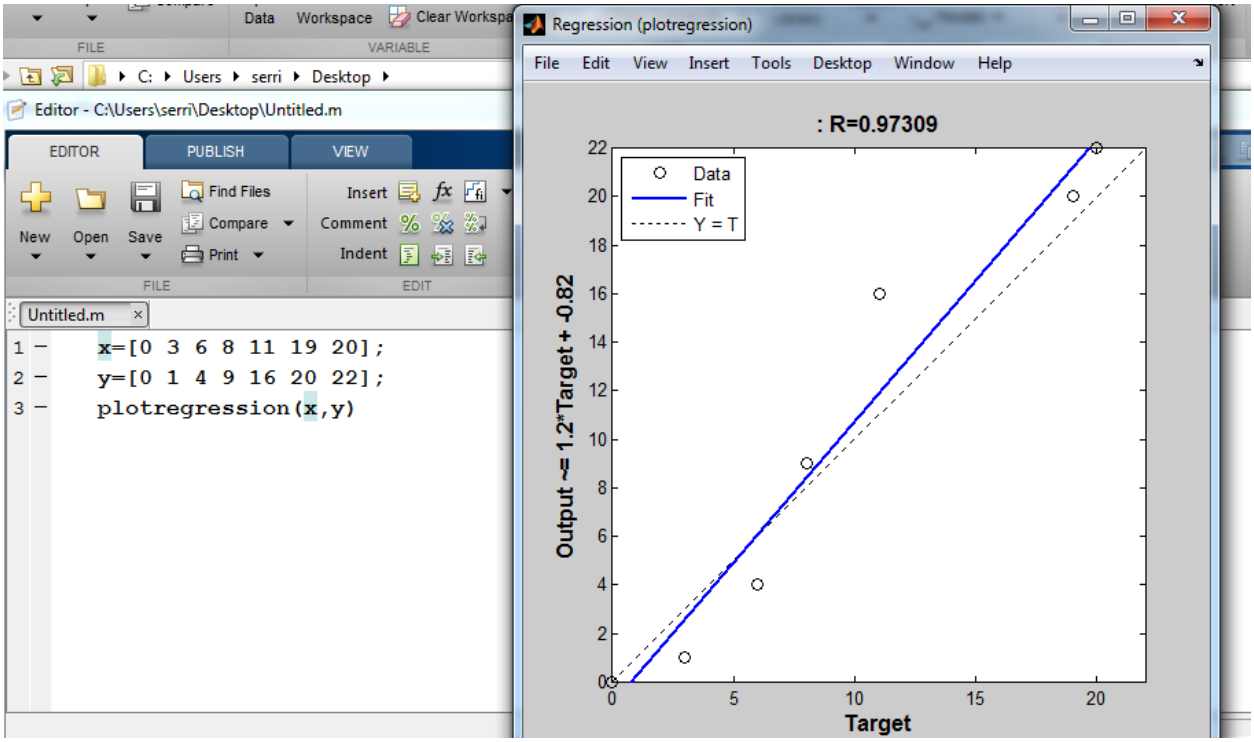


Fig(16)



Fig(17)

- Linear Regression
- EX11\ x=[0 3 6 8 11 19 20],y=[0 1 4 9 16 20 22].find Linear Regression plot.shown fig(18)

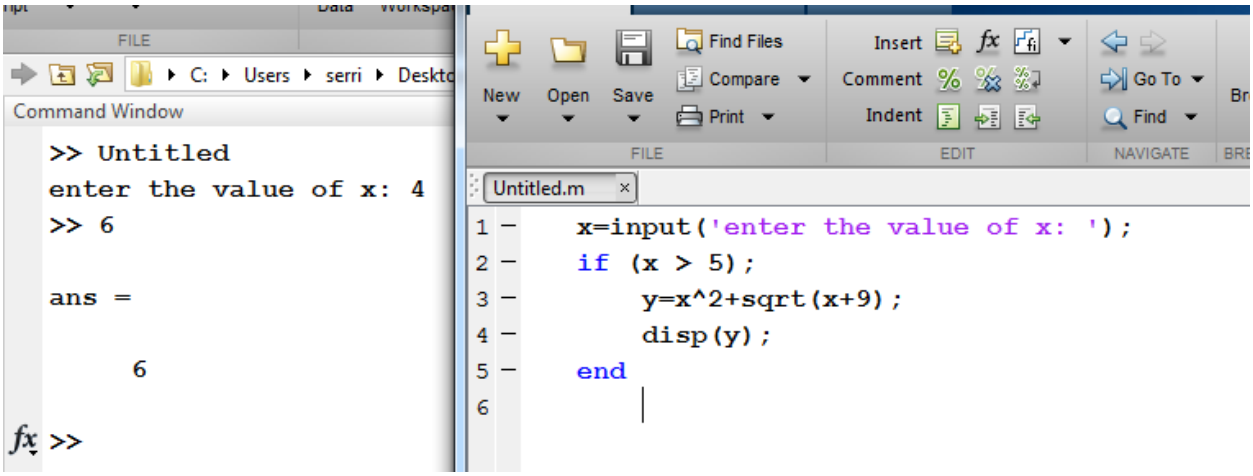

Data
Workspace
Clear Workspa
FILE
VARIABLE
C: ▸ Users ▸ serri ▸ Desktop ▸
Editor - C:\Users\serri\Desktop\Untitled.m
EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
Insert
Comment
Indent
FILE
EDIT
Untitled.m
1 — x=[0 3 6 8 11 19 20];
2 — y=[0 1 4 9 16 20 22];
3 — plotregression(x,y)
Regression (plotregression)
File Edit View Insert Tools Desktop Window Help
: R=0.97309
Data
Fit
Y = T
Output ~= 1.2*Target + -0.82
Target
0
2
4
6
8
10
12
14
16
18
20
22
0
5
10
15
20

Fig(18)

- Condition statements
  1- If…..end

```
If  + Condition
Statement
End
```

Ex1\ use matlab cods which ask for input ‘x’,and solve,the fuction $y=x^2+\sqrt{x+9}$ result, if x>5.shown fig(1)



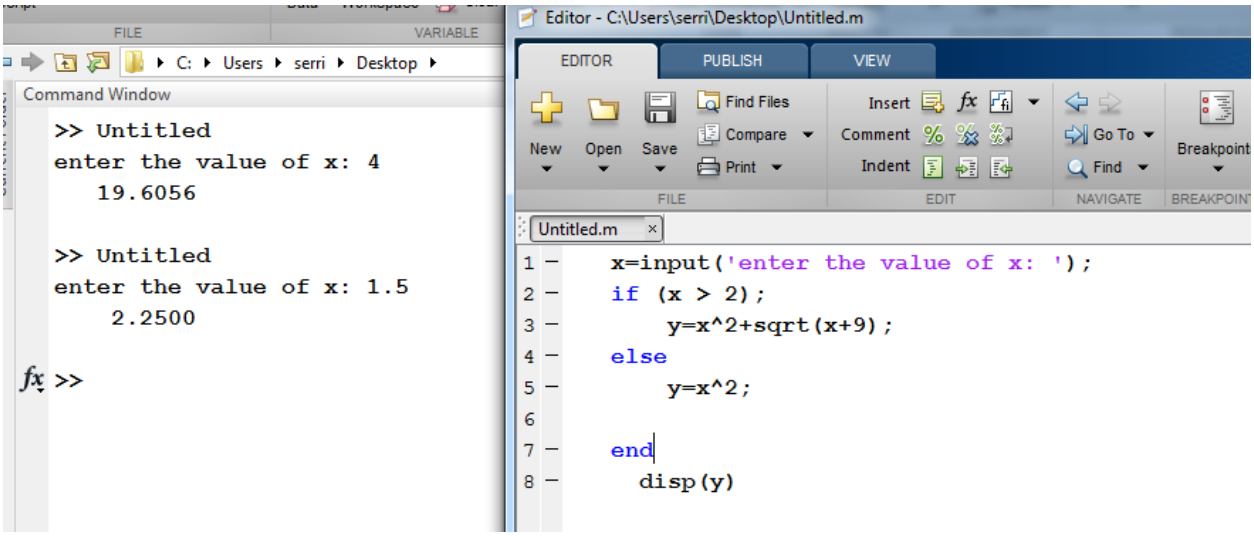
Fig(1)

2- If……else…….end

```
If  + Condition
Statement 1
Else
Statement 2
End
```

Ex2\ use mat lab cods which ask for input ‘x’,and solve, the function. shown fig(2)

$$y = \begin{cases} x^2 + \sqrt{x+9} & x > 2 \\ x^2 & x \leq 2 \end{cases}$$



Fig(2)

3- If…..elseif……else…….end

If + Condition1

Statement 1

Elseif +condition2

Statement 2

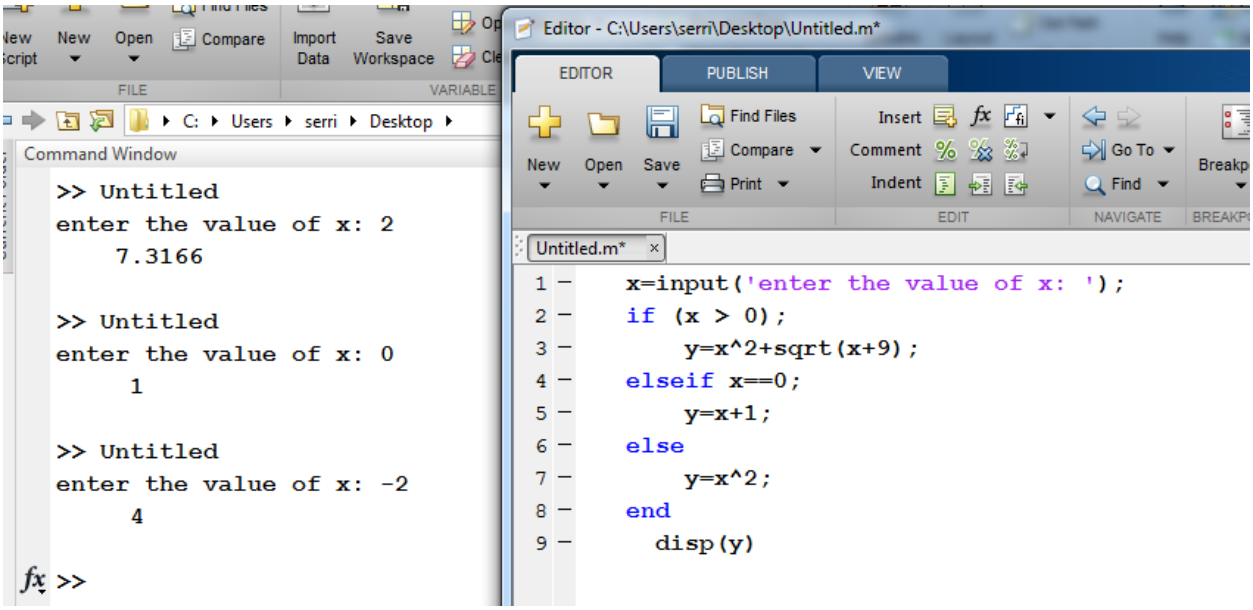
Else

Statement 3

End

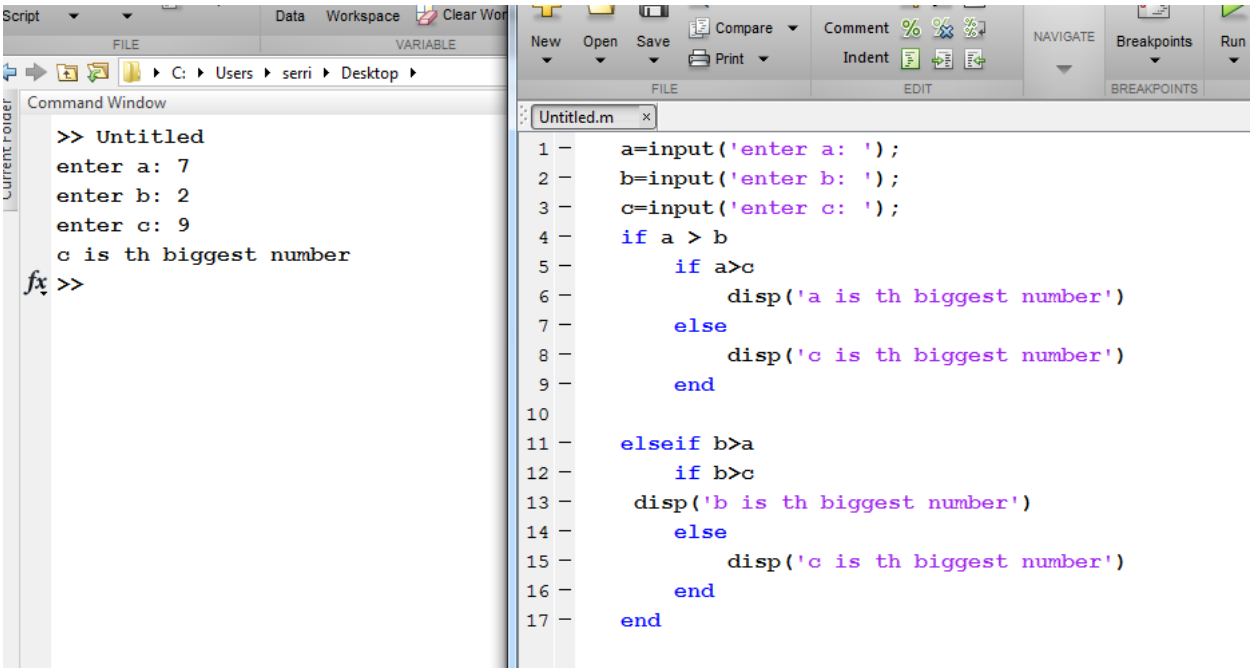
Ex3\ use mat lab cods which ask for input ‘x’,and solve, the function. shown fig(3)

$$y = \begin{cases} x^2 + \sqrt{x+9} & x > 0 \\ x + 1 & x = 0 \\ x^2 & x < 0 \end{cases}$$



Fig(3)

Ex4\ write mat lab cods to compare between three input numbers. shown fig(4)



Fig(4)

4- Switch …… case statement

switch + Condition1

case 1 value

statement 1

case 2 value

Statement 2

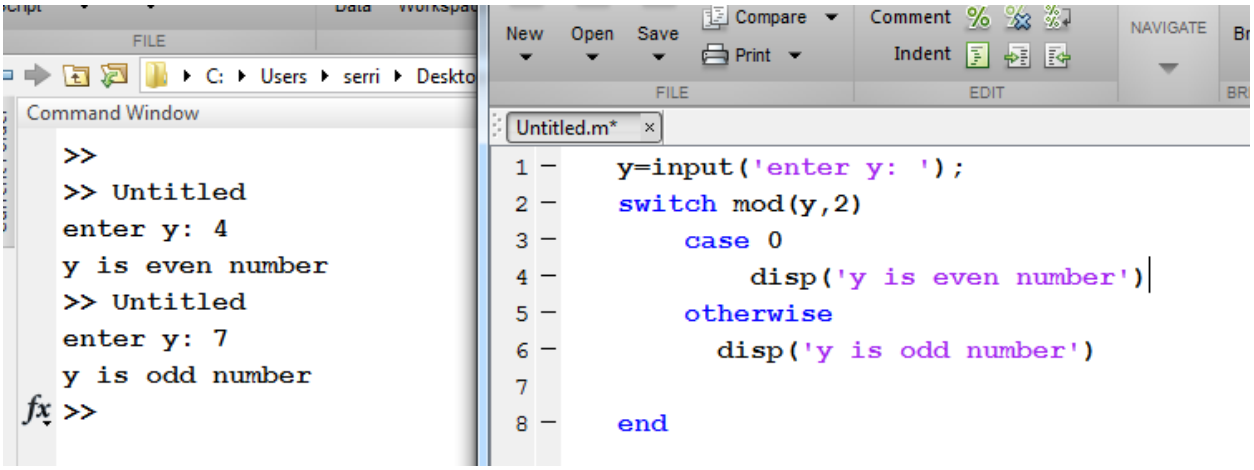
Case 3 value

Statement 3

otherwise

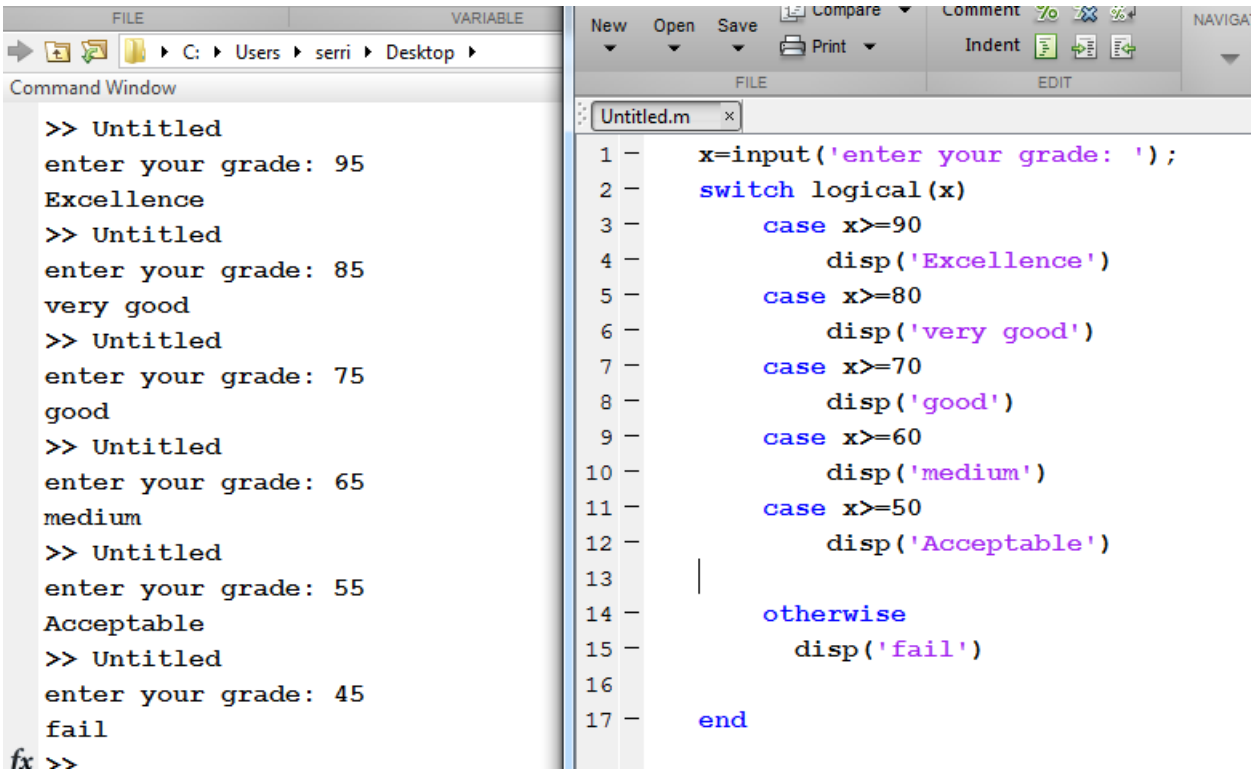
End

Ex5\write a mat lab program which asks for input ‘y’ and determining if the input is even or odd numbers. shown fig(5)



Fig(5)

Ex6\ write a mat lab program which asks for input ‘y’ (your grade)and determining . What is your assessment of the exam. shown fig(6)



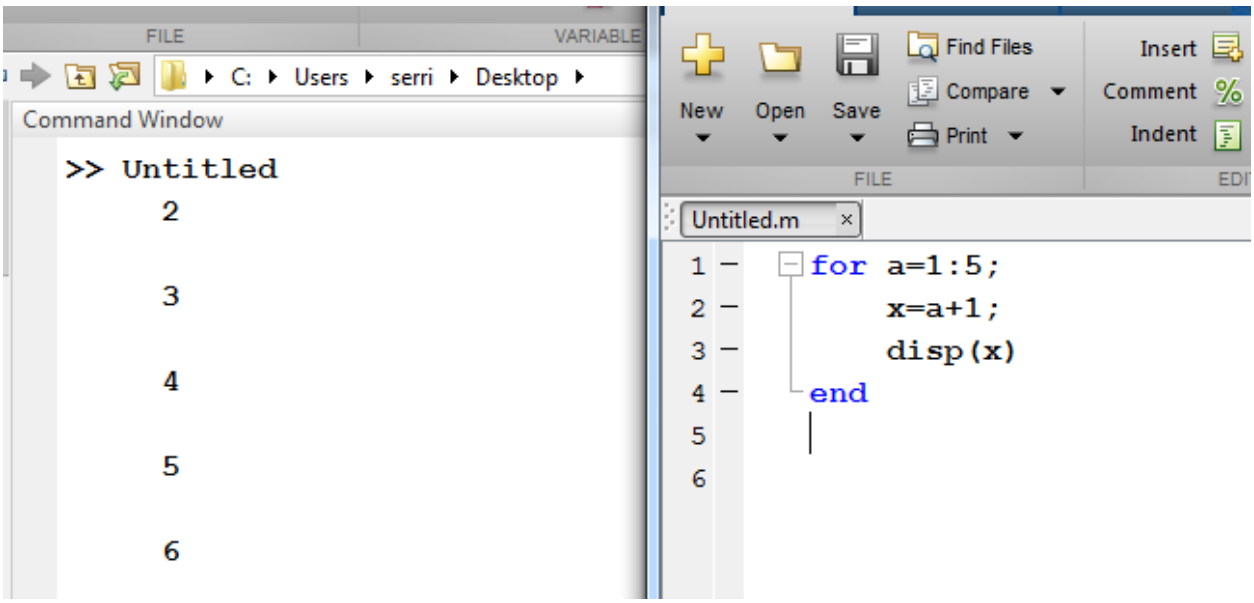
Fig(6)

- Loop function

1- For

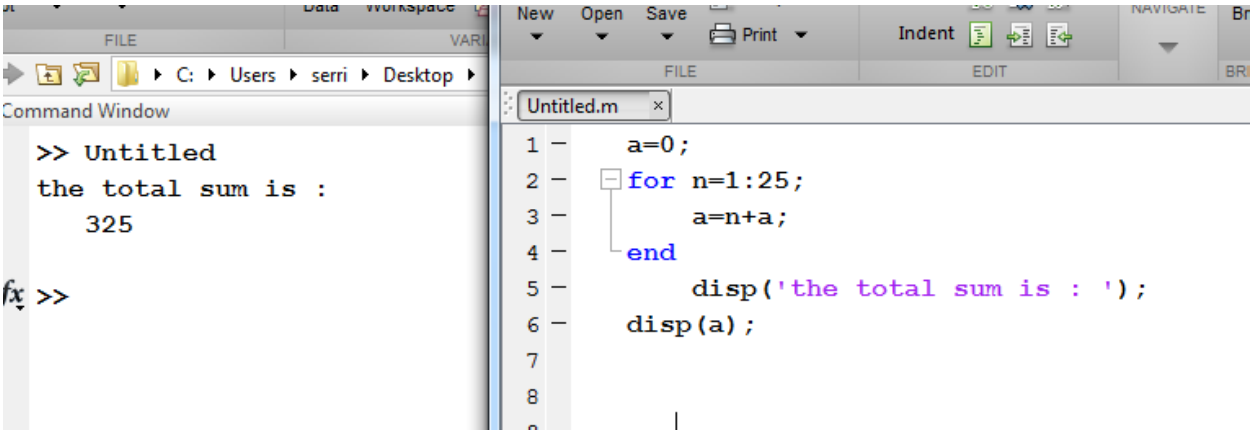
```
For  x= range
Statement
end
```

Ex7\ Enumerate x from 1 to 5. shown fig(7)



Fig(7)

Ex8\ write a matlab program that finds the sum of the first 25 numbers. shown fig(8)



Fig(8)

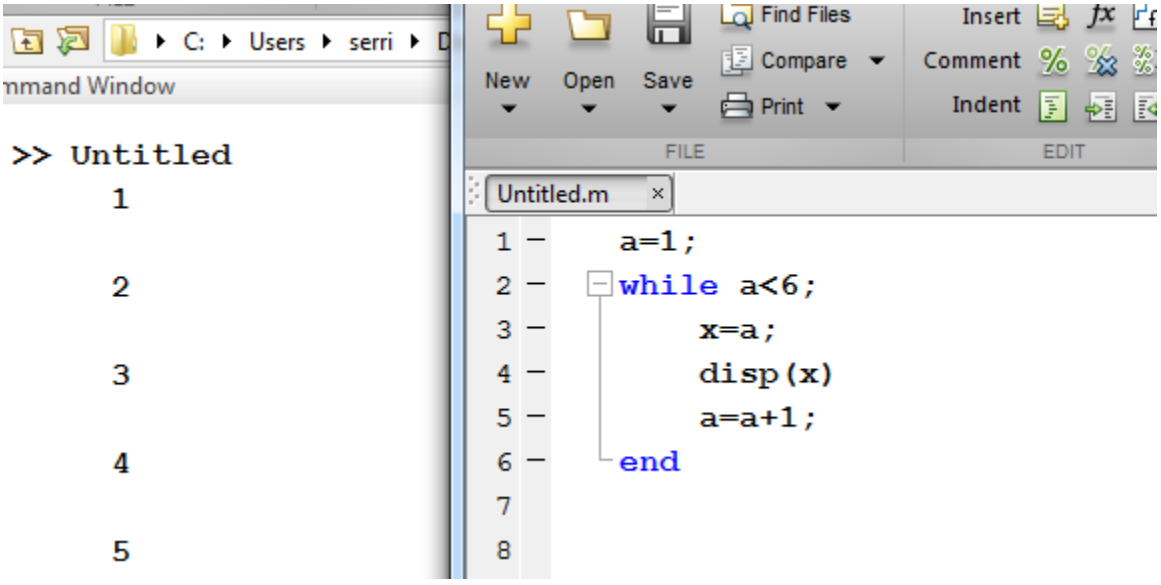
2-while

While + logical expression

Statement

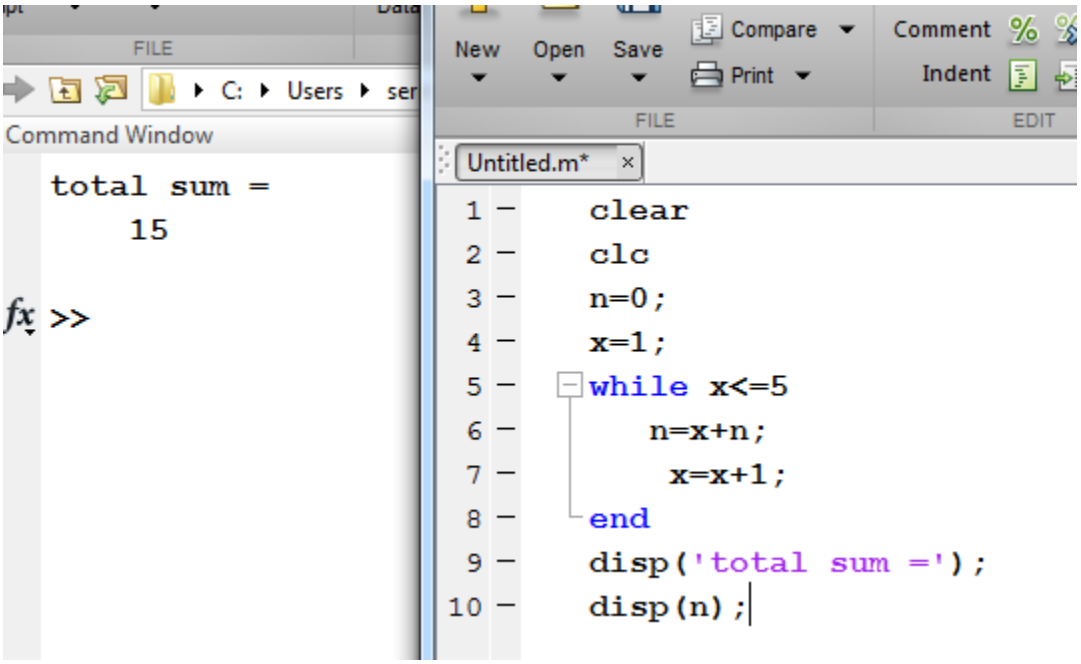
end

Ex9\ Enumerate x from 1 to 5.using while. shown fig(9)



Fig(9)

Ex10\ write a matlab program that finds the sum of the first 5 numbers.using while. shown fig(10)



Fig(10)

- Symbolic Math Toolbox: is provides functions for solving, plotting, and manipulating symbolic math equations. You can create, run, The toolbox provides functions in common mathematical areas such as calculus, linear algebra, algebraic and ordinary differential equations, equation simplification, and equation manipulation.

Ex1\ write the function x^3+5, Symbolic Math Toolbox.

Command Window

```
>> syms x
>> f=x^3+5

f =

x^3 + 5
```

Ex2\ Differetive the function x^3+5, and find second Differetive

```
Command Window
>> syms x
>> f=x^3+5

f =

x^3 + 5

>> diff(f)

ans =

3*x^2
```

```
>> syms x
>> f=x^3+5;
>> d=diff(f);
>> diff(d)

ans =

6*x
```

or

```
>> syms x
>> f=x^3+5;
>> diff(f,2)

ans =

6*x
```

ex\ Differetive the function x^2*y^2 ,for x , y,and second differetive for y

Command Window

```
>> syms x y
>> f=x^2*y^2

f =

x^2*y^2

>> d=diff(f)

d =

2*x*y^2

>> k=diff(f,y)

k =

2*x^2*y
```

```
>> syms x y
>> f=x^2*y^2;
>> k=diff(f,y,2)

k =

2*x^2
```

- Partial differentiation

```
>> syms x y
>> f=x^2*y^2;
>> k=diff(f,x)

k =

2*x*y^2

>> diff(k,y)

ans =

4*x*y
```

- Integration

Ex\ find Integration for x^2

```
>> syms x
>> f=x^2;
>> k=int(f)

k =

x^3/3
```

Limited integration

Ex\ find Integration for $\int_0^1 x^2$

```
>> syms x
>> f=x^2;
>> k=int(f,x,0,1)

k =

1/3
```

Ex\ find Integration for x^2+y^2

```
>> syms x y
>> f=x^2+y^2;
>> d=int(f,y)

d =

x^2*y + y^3/3
```

```
>> syms x y
>> f=x^2+y^2;
>> d=int(f,x)

d =

x^3/3 + x*y^2
```

- Subsute

Ex\ find the x^2+y^2 if (x=2),and (y=3),(integration x and sbus x=2,y=3) ,(x=1,2,3,4)

```
>> syms x y
>> f=x^2+y^2;
>> h=subs(f,x,2)

h =

y^2 + 4
```

```
>> syms x y
>> f=x^2+y^2;
>> h=subs(f,x,2)

h =

y^2 + 4

>> subs(h,y,3)

ans =

    13
```

```
>> syms x y
>> f=x^2+y^2;
>> k=int(f,x)

k =

x^3/3 + x*y^2

>> subs(f,{x,y},{2,3})

ans =

    13
```

```
>> syms x y
>> f=x^2+y^2;
>> subs(f,x,1:4)

ans =

[ y^2 + 1, y^2 + 4, y^2 + 9, y^2 + 16]
```

- Solve Fourier series in matlab

$$a_0 + \sum \left(a_n \cos(nx) + b_n \sin(nx) \right)$$

$$\begin{cases} a_0 = \frac{1}{2\pi} \int_{-\pi}^{\pi} f(x)dx, \\ a_n = = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x)\cos(nx)dx, \quad 1 \le n \\ b_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x)\sin(nx)dx, \quad 1 \le n. \end{cases}$$

Ex\find Fourier series in matlab for

$$f(x) = \begin{cases} \cos x & 0 < x < \pi \\ 0 & \pi < x < 2\pi \end{cases}$$

```
>> syms x n
>> d=cos(x);
>> h=0;
>> a0=(1/2*pi)*(int(d,x,0,pi)+int(h,x,pi,2*pi))

a0 =

0
```

```
>> syms x n
>> d=cos(x);
>> n=1:3;
>> (1/pi)*(int(d*cos(n*x),x,0,pi))

ans =

[ (5734161139222659*pi)/36028797018963968, 0, 0]

>> (5734161139222659*pi)/36028797018963968

ans =

    0.5000
```

```
>> syms x n
>> d=cos(x);
>> n=1:3;
>> (1/pi)*(int(d*sin(n*x),x,0,pi))

ans =

[ 0, 1911387046407553/4503599627370496, 0]

>> 1911387046407553/4503599627370496

ans =

    0.4244
```

*Laplace transform

Ex\find laplace 5t,sin5t+e^{-8t}

```
>> syms t
>> f=5*t;
>> laplace(f)

ans =

5/s^2
```

```
>> syms t
>> f=sin(5*t)+exp(-8*t);
>> laplace(f)

ans =

1/(s + 8) + 5/(s^2 + 25)
```

- Inverse laplace

Ex\find ilaplace $5/s^2$, $\frac{1}{s+8}+\frac{5}{s^2+25}$

```
>> syms s
>> f=5/s^2;
>> ilaplace(f)

ans =

5*t
```

```
>> syms s
>> f=(1/(s+8))+(5/(s^2 +25));
>> ilaplace(f)

ans =

exp(-8*t) + sin(5*t)
```