By

Esraa A. Haydier

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Chapter -1-

- **MATLAB**

MATLAB (an abbreviation of "matrix laboratory") is a proprietary multi-model programming language and numerical computing environment developed by MathWorks . MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms.

- **Why Matlab is useful?**
- 1- Conducting mathematical and engineering operations.
- 2- Development of algorithms.
- 3- Modeling and simulations.
- 4- Data analysis and presentation.
- 5- Conducting engineering graphs.
- 6- Application development.

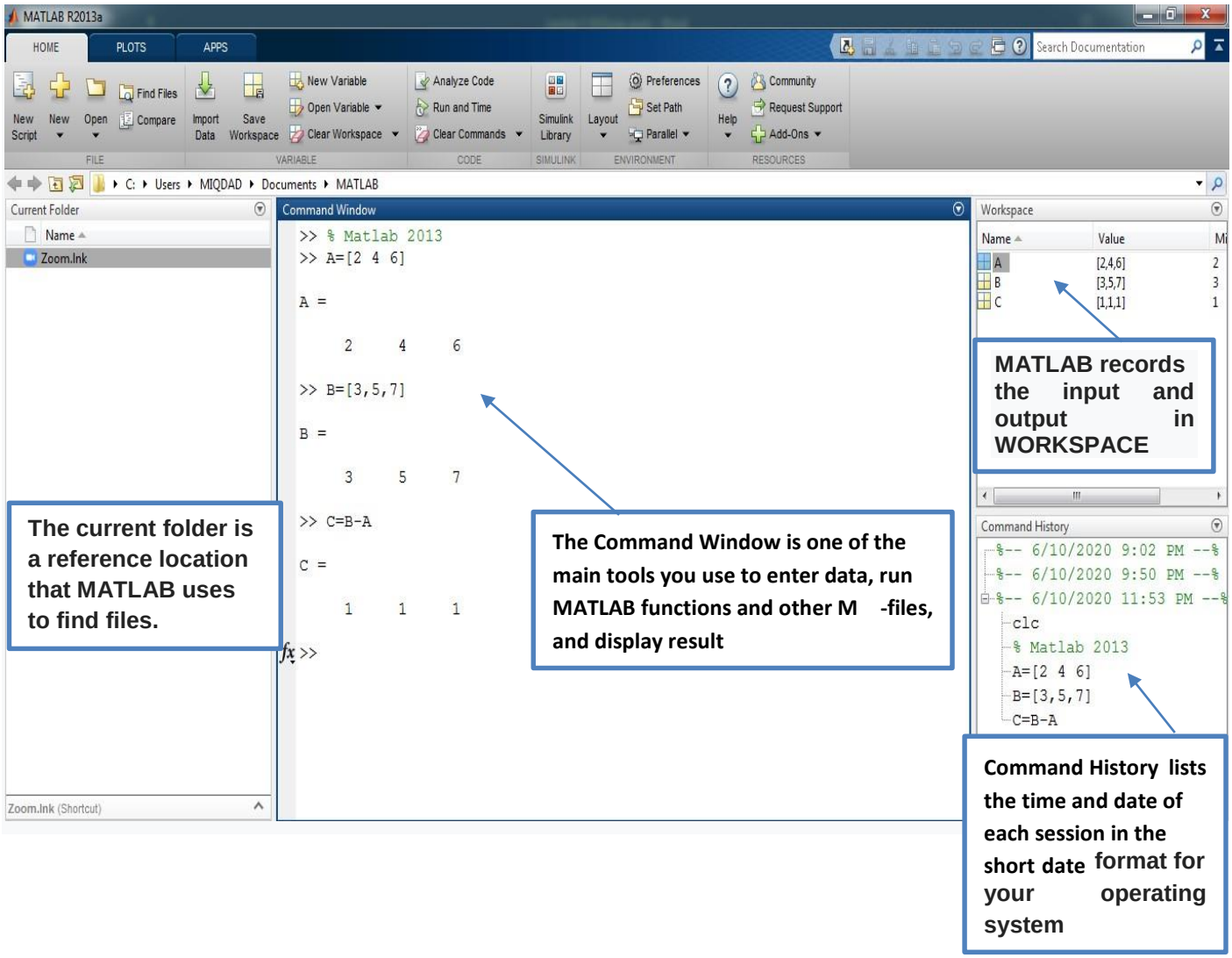
- **Matlab Windows**

Work area divided into three Main area, which are the following:

1- Command Window: This is the main window commands can also be type on this screen and the results were shown in it .

2-Workspace : MATLAB records the inputs and outputs in this screen.

3-Command History: This is the space in which MATLAB stores the previous commands.



- *General Commands in Matlab*

1 -Stopping MATLAB in different ways:

a- By means of the command: quit

b- Clicking on the cross in the upper right of your window.

2-Changing Font Size:

On the Home tab, in the Environment section, click Preferences ► Fonts and select a font size.

3- Some delete commands in matlab

a- Type clc : To clear your command window without erasing the variables and functions that you have recorded in the Workspace window or the command history window

b- To remove a variable or data in workspace type clear: You can also clear a specific variable: just follow the clear command with the variable name.

C- To clear all windows such as Command window, command history and workspace:

On tab HOME Go to ⟶ Clear command window
Clear command History
Clear workspace

d- Clear **:** Use to Remove variables from the memory.

4- help: search for help

5-Exist: check if the variable exists or not and gives either 0 or 1

6 - load: Load variables from the workspace.

7 - **%** : To Put titles during programming.

Arithmetic operations

Symbol	Operation	Matlab form
^	power	A^B
*	multiplication	A*B
/	right division (slash)	A/B
\	left division (backslash)	A\B=B/A
+	addition or plus	A+B
-	subtraction or negation	A-B

Example :

1) Write using matlab the following :

1) $A = 6\frac{10}{13} + 18\frac{5}{7} + 5\ (9)^2$

SOL :

```
A=6*(10/13) +18 *(5/7)+5*(9^2)
A =
  422.4725

A=(6*(10/13)) +(18*(5/7))+(5*(9^2))
A =
  422.4725
```

2) ***Find the value of z if you know that x = 2 , y =17***

$$Z = X^3 + Y^2 + \frac{3\pi}{X^2 + Y^2}$$

```
x = 2
y = 3

z= x^3+y^2+(3*pi/(x^2+y^2))

z=17.2
```

3) $f(X) = X^3 + \sin(9X)$

f(X) = X^3+sin(9 ∗ X)

4) ***Solve the following equation*** :

$$y = e^{-a}\sin(x) + 10\sqrt{y}$$

```
a = 5; x = 2; y = 8;
y = exp(-a)*sin(x)+10*sqrt(y)
y =
    28.2904
```

To calculate sin(π/4) and e10, we enter the following commands in MATLAB,

```
sin(pi/4)
ans = 0.7071

>> exp(10)

ans = 2.2026e+004
```

4) ***Find derivative for the function f***

a) $f = x^2 e^x$

f =2*x*exp(x)+x^2*exp(x)

By matlab

syms x

diff (*f*)

b) $g = xy + x^2$

syms x y

diff (g)

5) ***Find integral for the this function:***

a)$\int_2^3 (8x^3 + 3x^2 + 6x)\, dx$

$$= 8\ \frac{x^4}{4} + 3\ \frac{x^3}{3} + 6\frac{x^2}{2}\ \vdots_2^3$$

By matlab

int((8*x^3+ 3*x^2+6*x),2,3)

H.W 1 //

- $Y=\frac{2e^{2t}+2e^{-t}}{\log 2}$
- $a=\frac{2x}{4y}$
- $b=\pi r^2$
- $c=\frac{x}{2x-y^2}$
- $x(t)=e^{-0.1t}$
- $d=\sqrt{x^2+y^2}$
- $e=\frac{\sin 2t+\cos 5t}{2}$

H.W 2// Find the derivative for the following function:

1) $f=\sin(\pi\, t)$

2) $f=\cos(x^2)+\sin(x)$

3) $f=\frac{2x}{x^2-1}$

4) $f=\frac{1}{1+e^{-x}}$

H.W // Find integral for the following function:

1) $f=\int_0^{\pi}\sin(x)\,dx$

2) $f=\int_1^4 xe^x(x)\,dx$

3) $f=\int_0^1\sqrt{1+x^3}\,dx$

Chapter -2-

M Files

MATLAB allows writing Several kinds of program files we mention some of them:

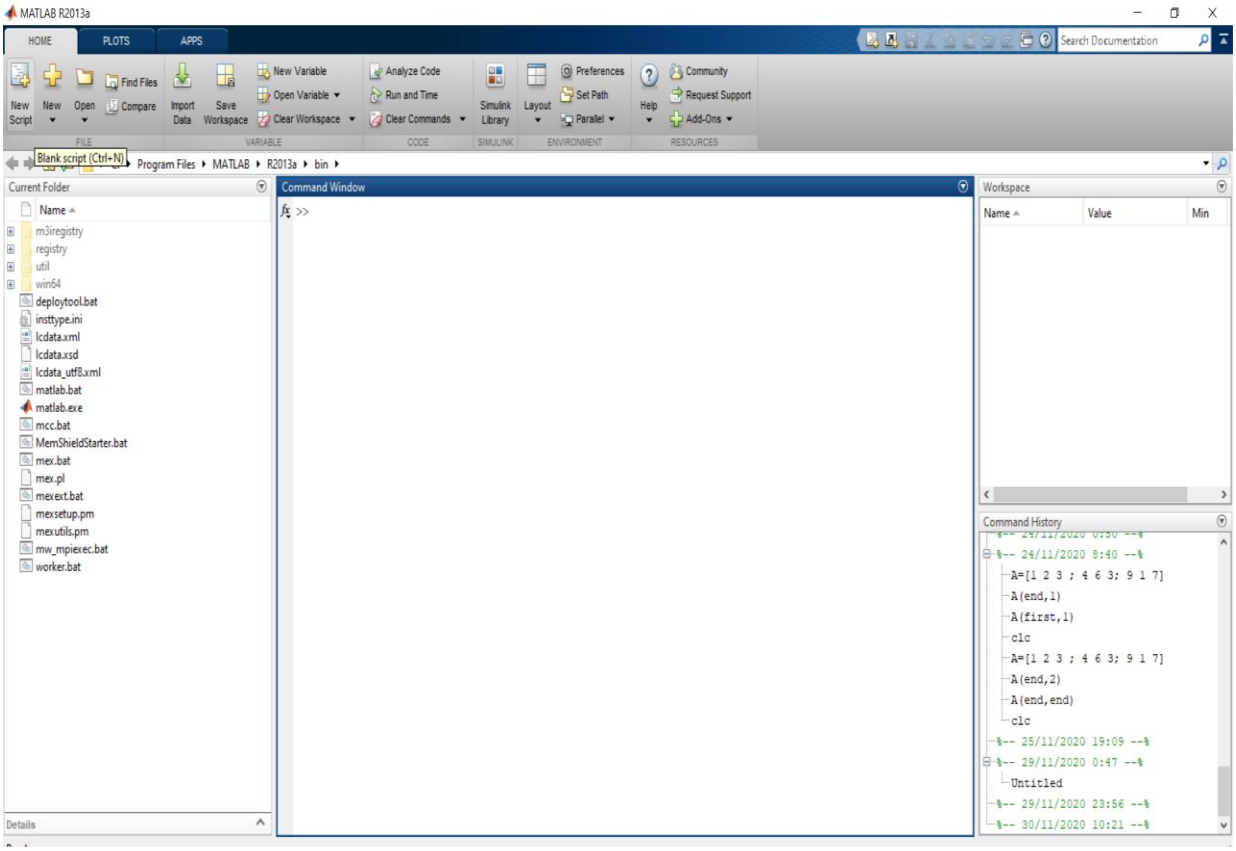
***Scripts**: Are the kind of files script that a program works on MATLAB as a means of entering commands and code, where program commands are edited in a File Script .*

***Functions:** functions files are also program files with .m extension. Functions can accept inputs and return outputs. Internal variables are local to the function.*

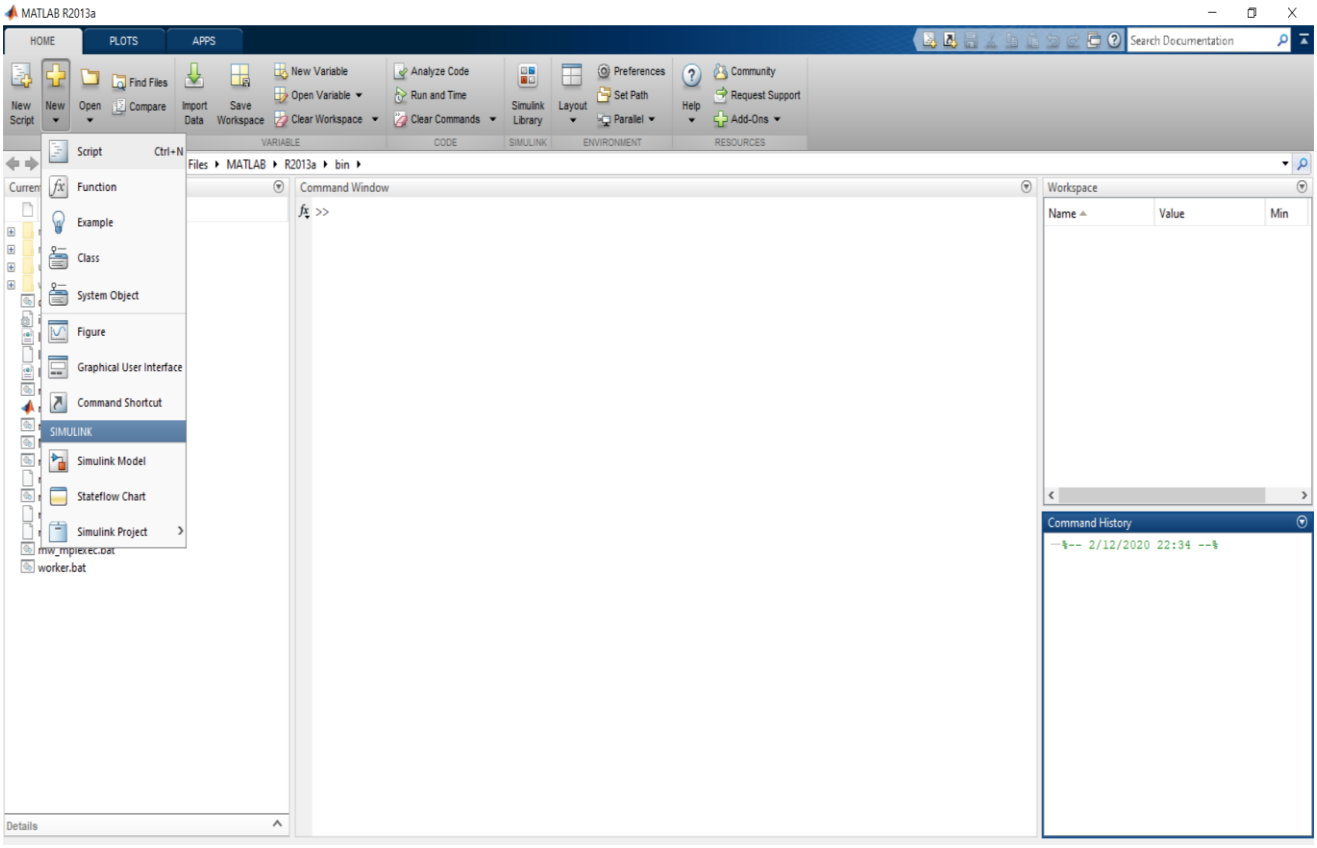
- ***Create a new File-M:***

There are two ways to create a new file to write MATLAB:

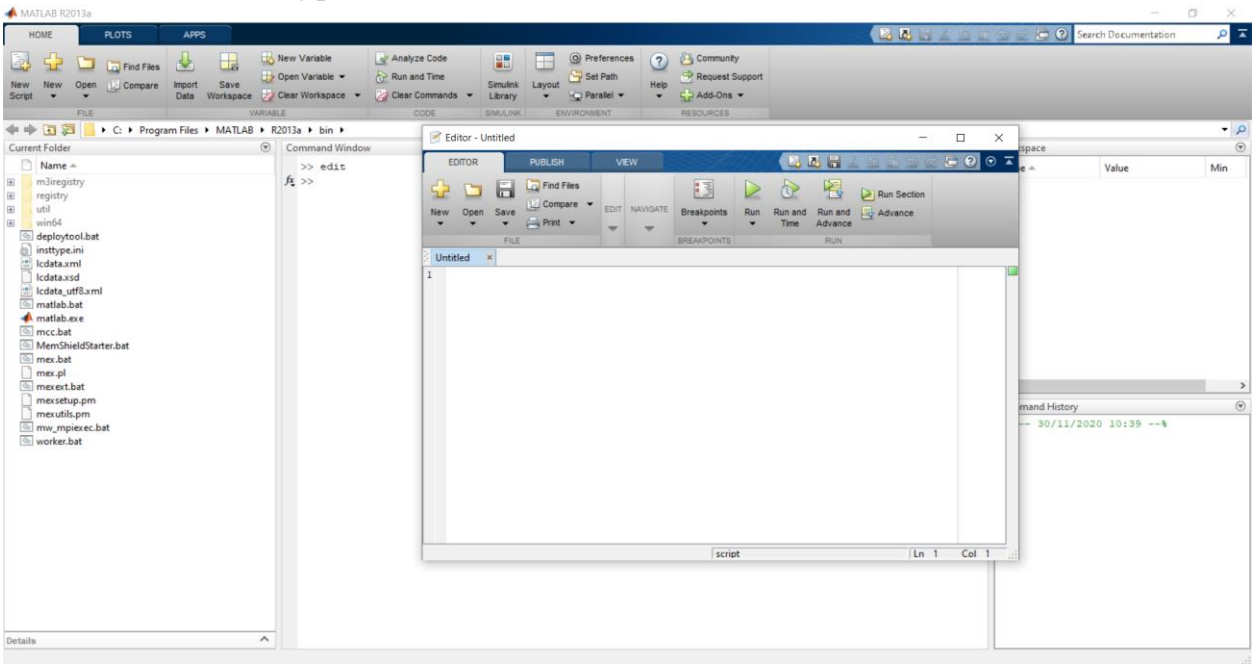
*1- **First way**: -from the Home menu choose new script as in the following: -*



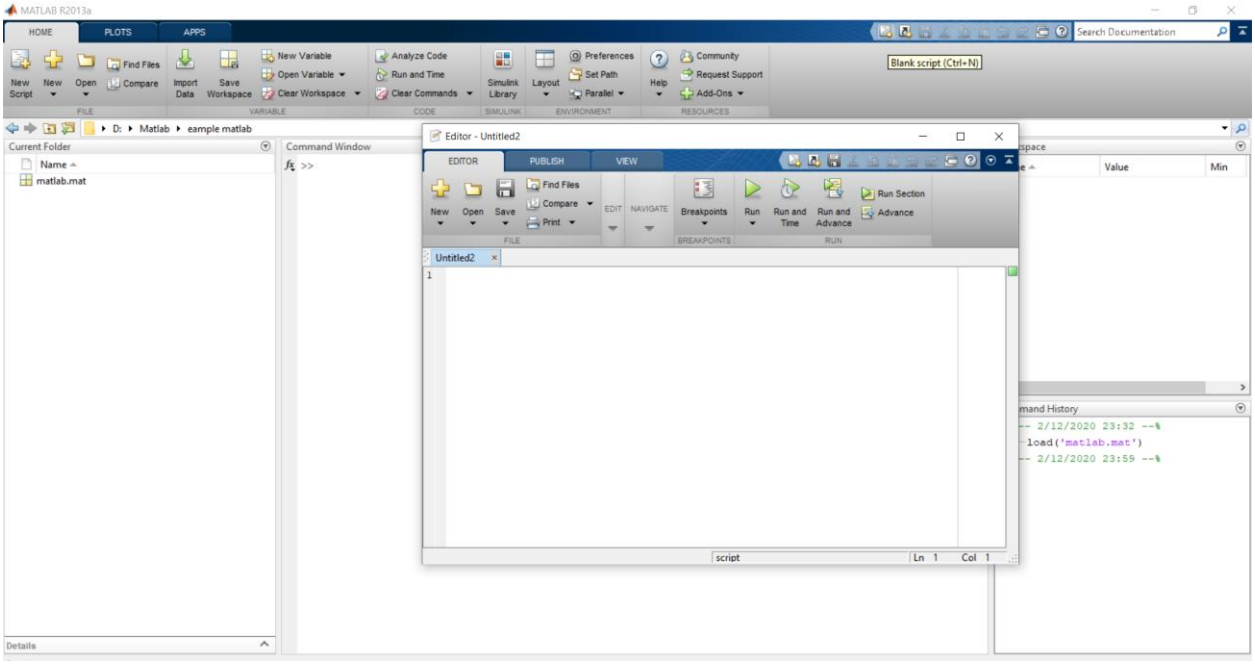
*2- **Second way**: -from the Home menu choose new ⟶ script as in the following:*



*3- **Third Method**: Type the edit command inside the Window Command window as follows:*



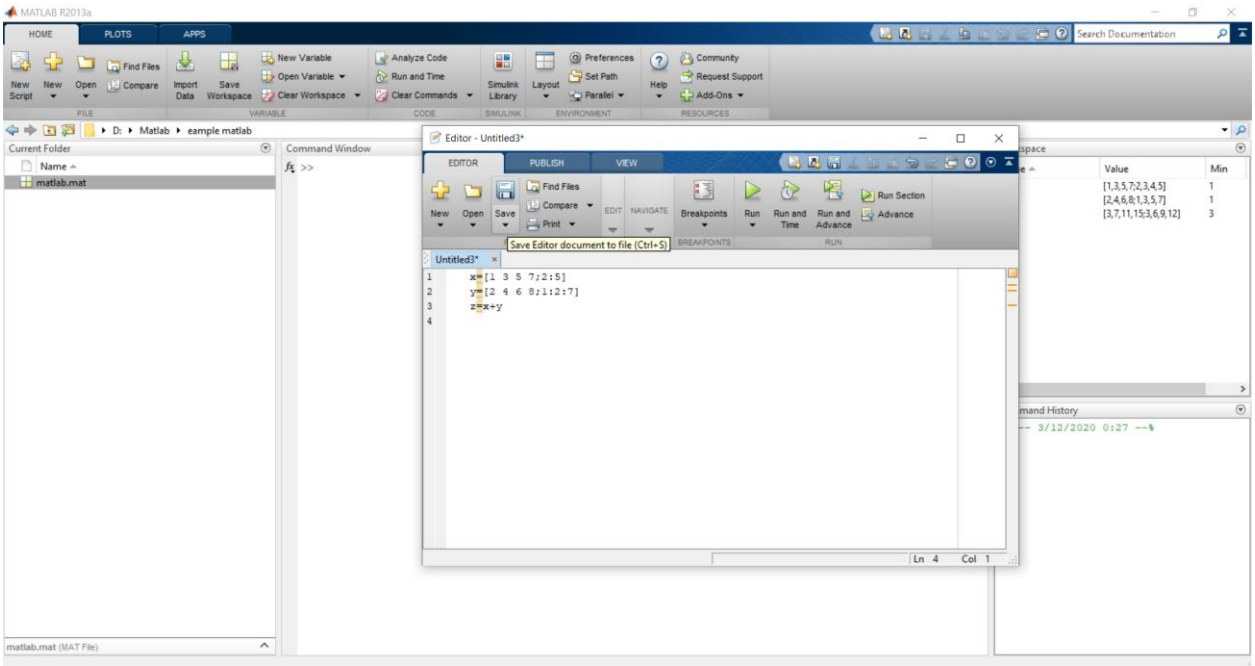
*4- **Fourth Method**: In the right upper part of the matlab program we choose Blank script as follows:*



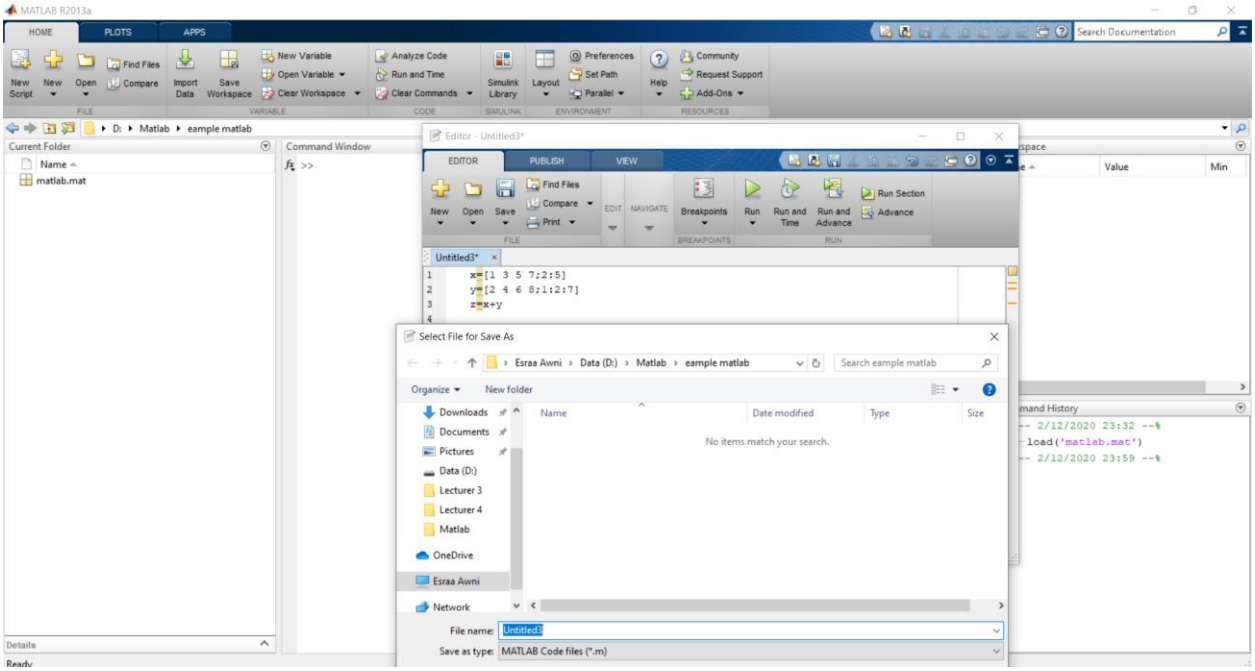
***Fifth method**: In the keyboard click (ctrl+N)*

Methods for storing programs in an m-file

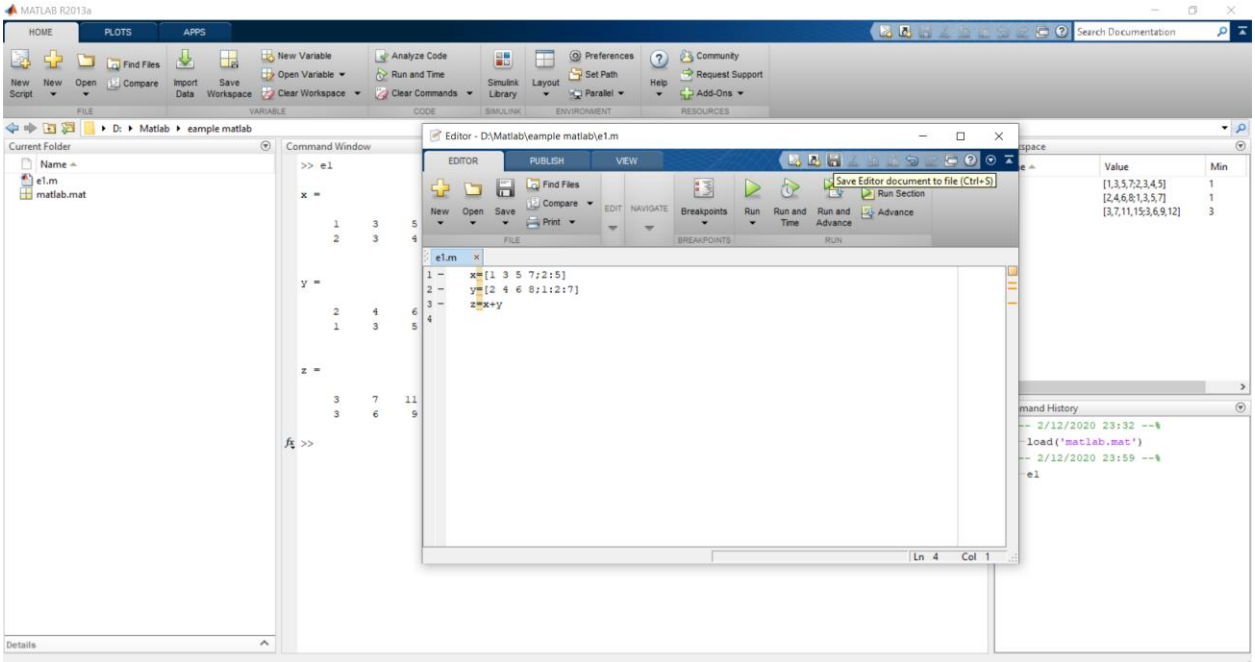
***First way:** In the EDITOR list in m-file choose icon save as the follows:*



***Second way**: In the EDITOR list in m-file choose icon Run as the follows:*



***Third way** :In the right upper part of the matlab program we choose save as follows*



***Fourth method**: Use F5 or (ctrl+S) from the keyboard.*

General Note:

1-We can implementation of specific step in command program by select those steps and use the right click and choose ***Evaluate Selection.***

2- we can get all the windows through :

Menu Home ---------- Layout ---------- Default

3- We can enter several step in the command window without running by using (Shift +Enter) after each step.