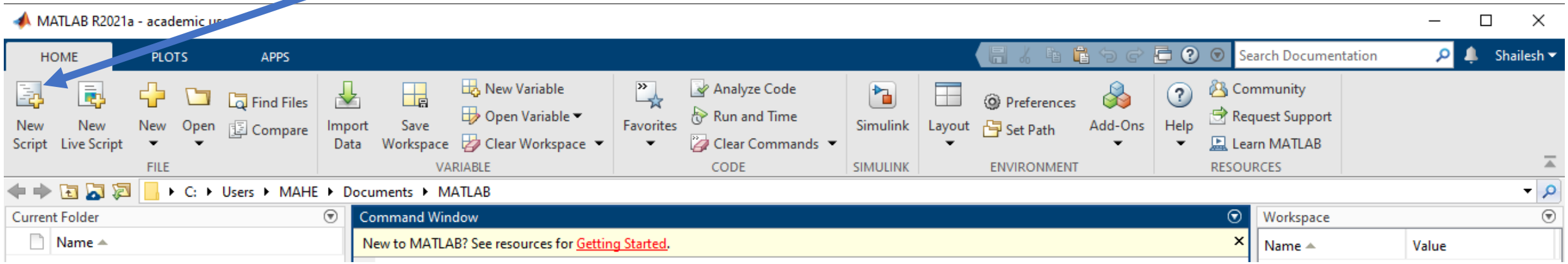
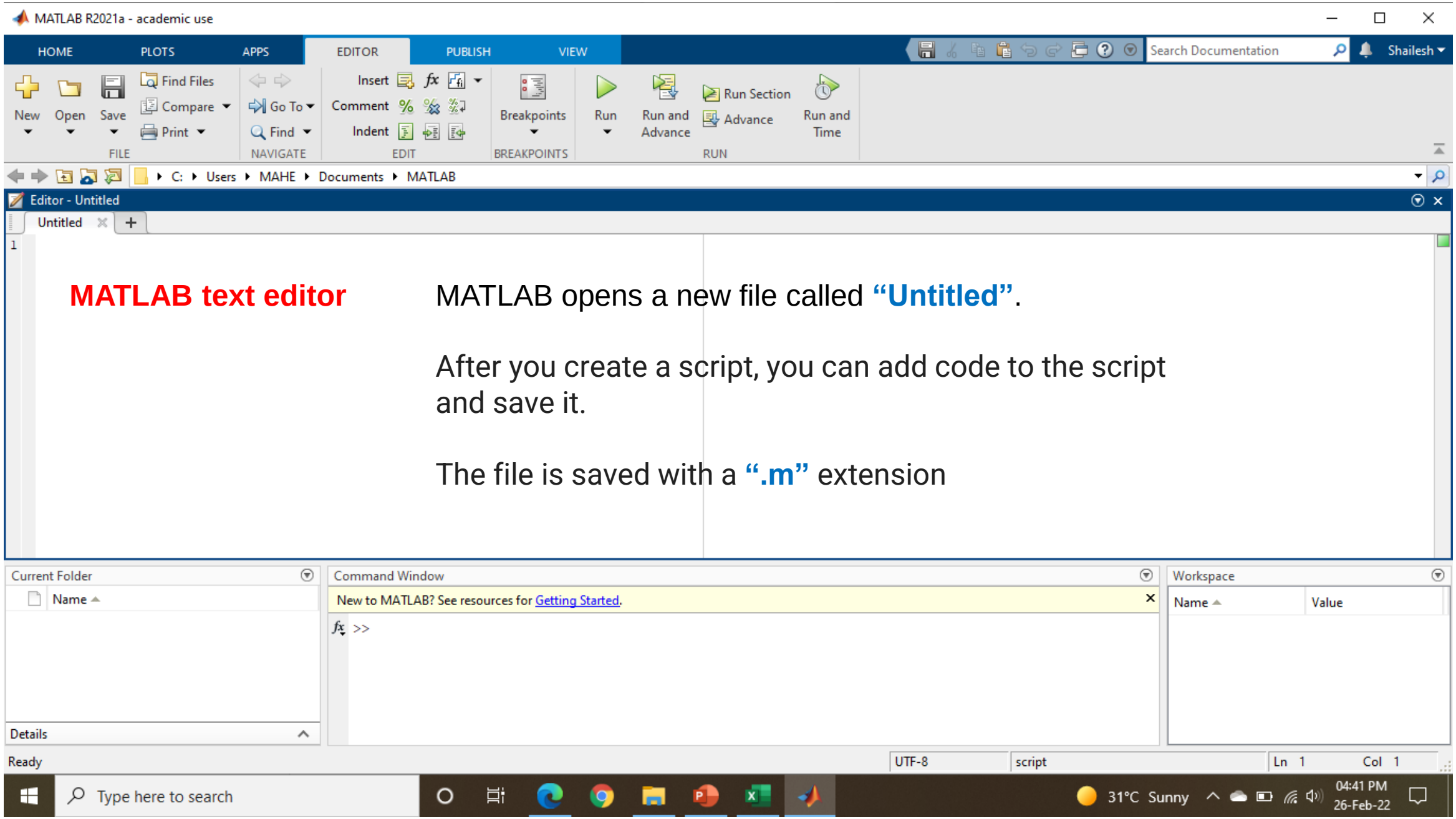
Scripts and Functions

Programming in MATLAB

Scripts (.m files)

- **Scripts** are program (code) files.
- Scripts contain a series of **sequential MATLAB statements and function calls**.
- In command window type >> **edit**
- Or click on "**New Script**" on MATLAB toolbar





MATLAB text editor

MATLAB opens a new file called **"Untitled"**.

After you create a script, you can add code to the script and save it.

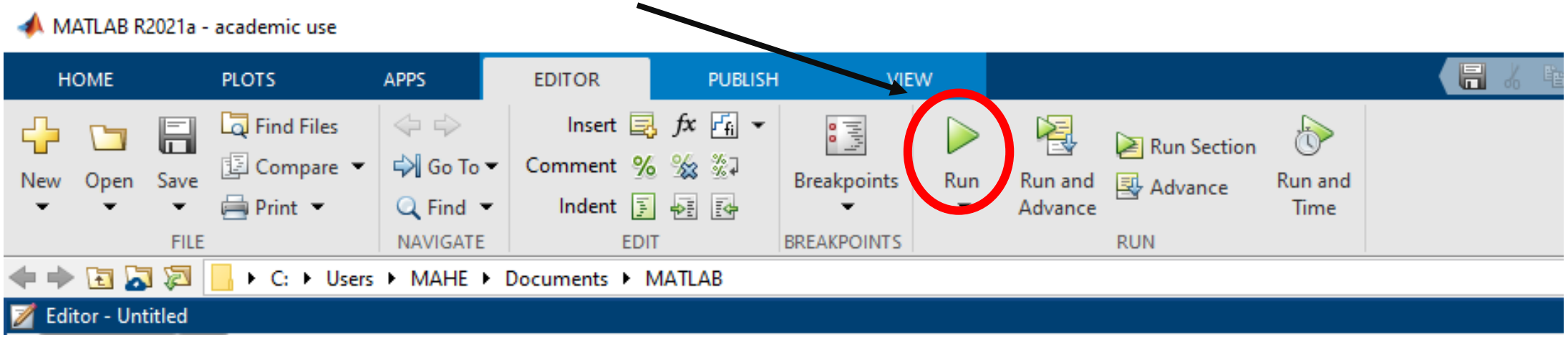
The file is saved with a **".m"** extension

Running the script

- Save your script and run the code using either of these methods:

- Type the script name on the **command line** and press **Enter**.
- For example,
  - to run the **numGenerator.m** script, type >> **numGenerator**

- On the **Editor** tab, click the **Run** button.



Comments in MATLAB

- Comments allow **others** to **understand** code and one can **refresh** their memory when they **return to it later**.

- During code **development** and testing, one can use **comments** to **comment** out **any code** that **does not need to run**.

- To add comments to MATLAB code, use the percent (**%**) symbol.
  - Comment lines can appear anywhere in a code file, and one can append comments to the end of a line of code.

Comments in MATLAB

- To comment out multiple lines of code, use the block comment operators, %{ and %}.
- The %{ and %} operators must appear alone on the lines that immediately precede and follow the block of help text.
- Do not include any other text on these lines.

Example code :

```
a = magic(3);

%{
sum(a)
diag(a)
sum(diag(a))
%}

sum(diag(fliplr(a)))
```

Effective Use of Script Files

- Follow the MA TLAB convention for **naming variables**.
- Avoid giving **script files** the **same name** as a **variable** it computes.
- Do not give a **script file** the **same name** as a MATLAB **command** or **function**.
- Use **exist** command – try >> help **exist**

Debugging Script Files

- **Debugging** a program is the process of **finding** and removing **errors.**
- **Syntax errors** - MATLAB usually detects and displays a message describing the error and its location.
- **Always test the code** with a simple version of the problem, whose **answers** can be checked by **hand calculations**.
- **Display** any **intermediate calculations** by **removing semicolons** at the end of statements.

Programming Style

- **Comments section** – About the input, output variables and user defined functions or any other relevant information.
- **Input section** - About input data and/or the input functions that enable data to be entered.
- **Calculation section –** Functions and algorithms required for calculations in this section.
- **Output section –** Functions necessary to deliver the output in whatever form required.

Input/output commands

- **disp**(A) Displays the contents, but not the name, of the array A.

- **disp**(‘text’) Displays the text string enclosed within single quotes.

- x = **input**(‘text’) Displays the text in quotes, waits for user input from the keyboard, and stores the value in x.

- x = **input**(‘text’,’s’) Displays the text in quotes, waits for user input from the keyboard, and stores the input as a string in x.

Example : Type

```
>> disp(‘The predicted speed is:’)
>> disp(Speed)
```

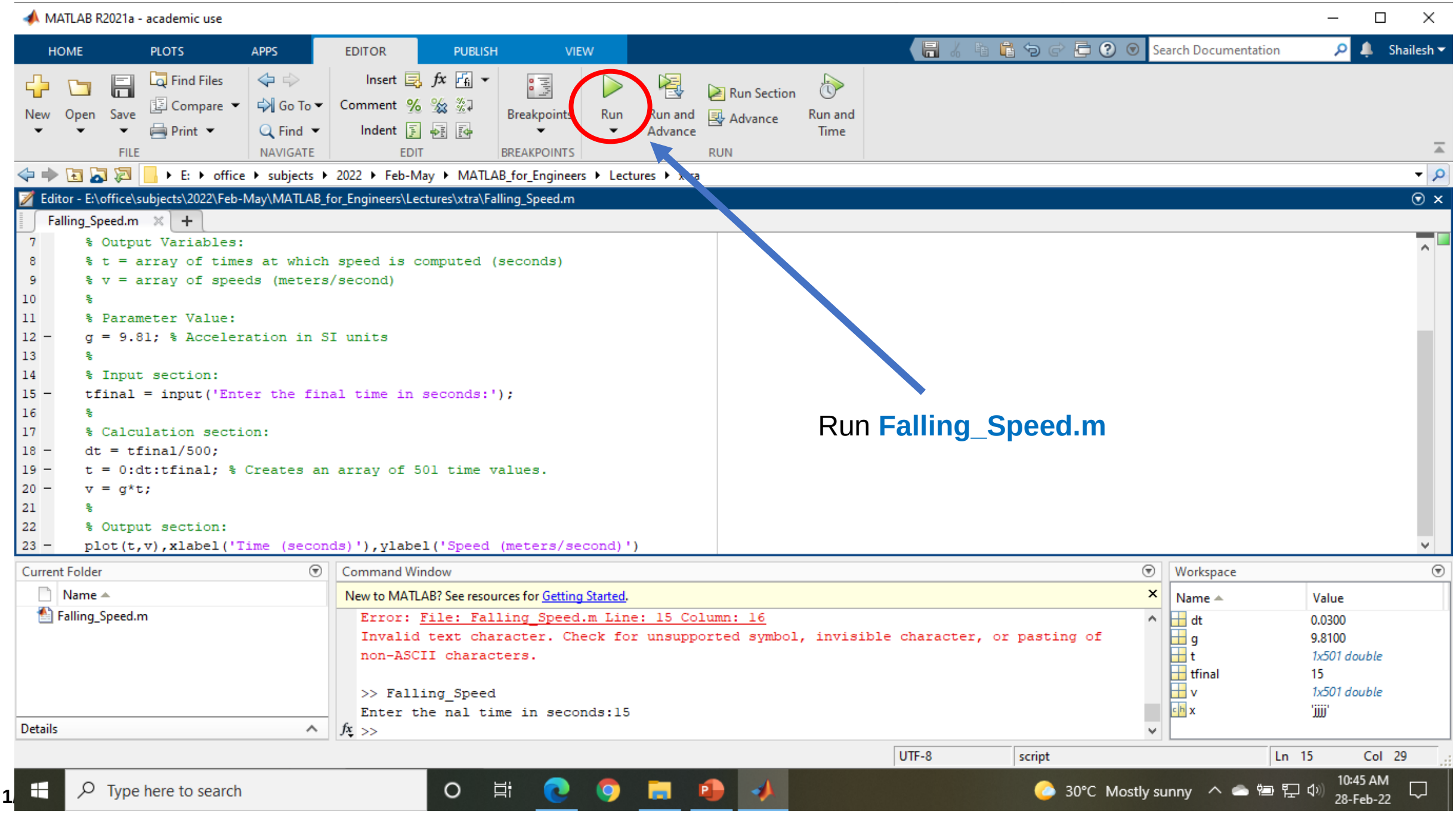
Example of a Script File

- % **Program Falling_Speed.m: plots speed of a falling object.**
- % **Created on** March 1, 2009 by W. Palm III
- %
- % **Input Variable:**
- % tfinal = final time (in seconds)
- %
- % **Output Variables:**
- % t = array of times at which speed is computed (seconds)
- % v = array of speeds (meters/second)
- %
- % **Parameter Value:**
- g = 9.81; % Acceleration in SI units

% **Input section:**
tfinal = input('Enter the final time in seconds:');
%
% **Calculation section:**
dt = tfinal/500;
t = 0:dt:tfinal; % Creates an array of 501 time values.
v = g*t;
%
% **Output section:**
plot(t,v),xlabel('Time (seconds)'),ylabel('Speed (meters/second)')

Save and Run **Falling_Speed.m**

- After creating this file, you save it with the name **Falling_Speed.m**.
- To run it, you type **Falling_Speed** (without the .m) in the Command window at the prompt.
- >> **Falling_Speed**
- You will then be asked to enter a value for **tfinal** .
- After you enter a value and press **Enter**, you will see the plot on the screen.


MATLAB R2021a - academic use
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Insert
Comment
Indent
EDIT
Breakpoints
BREAKPOINTS
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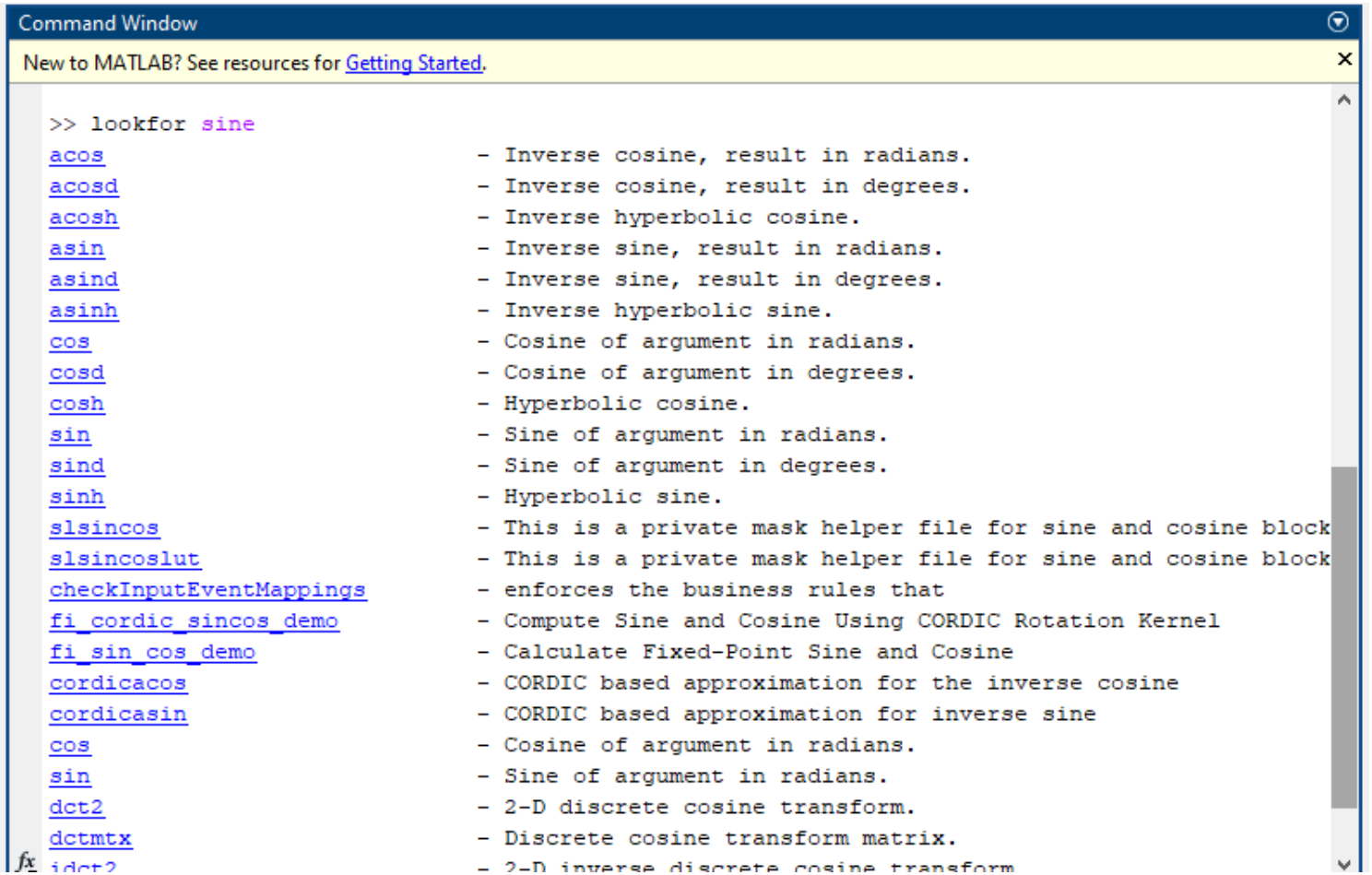
Falling_Speed.m
7 % Output Variables:
8 % t = array of times at which speed is computed (seconds)
9 % v = array of speeds (meters/second)
10 %
11 % Parameter Value:
12 g = 9.81; % Acceleration in SI units
13 %
14 % Input section:
15 tfinal = input('Enter the final time in seconds:');
16 %
17 % Calculation section:
18 dt = tfinal/500;
19 t = 0:dt:tfinal; % Creates an array of 501 time values.
20 v = g*t;
21 %
22 % Output section:
23 plot(t,v),xlabel('Time (seconds)'),ylabel('Speed (meters/second)')
Run Falling_Speed.m
Current Folder
Name
Falling_Speed.m
Details
Command Window
New to MATLAB? See resources for Getting Started.
Error: File: Falling_Speed.m Line: 15 Column: 16
Invalid text character. Check for unsupported symbol, invisible character, or pasting of non-ASCII characters.
>> Falling_Speed
Enter the nal time in seconds:15
>>
Workspace
Name
Value
dt 0.0300
g 9.8100
t 1x501 double
tfinal 15
v 1x501 double
x 'jjjjj'
UTF-8
script
Ln 15
Col 29
Type here to search
30°C Mostly sunny
10:45 AM
28-Feb-22

The lookfor Function

- **lookfor** - Search all MATLAB files for keyword.

- Type >> help sine.m
- >> sine.m not found

- Type >> lookfor sine



Problem-Solving Methodologies

- Steps in Engineering Problem Solving –
- 1. **Understand** the purpose of the **problem**.

- 2. **Collect** the known and relevant **information - INPUT**.
  - Realize that some of it might later be found **unnecessary**.

- 3. **Determine** what **information** you must **find - OUTPUT**.

- 4. **Simplify** the **problem** only enough to obtain the required information. State any **assumptions** you make.

- 5. Draw a **sketch** and **label** any necessary **variables**.

Problem-Solving Methodologies

- Steps in Engineering Problem Solving –

- 6. Determine which **fundamental principles (Example : Newton's laws)** are applicable.

- 7. Think generally about your **proposed solution** approach and consider **other approaches** before proceeding with the details.

- 8. Label each step in the solution process.

Problem-Solving Methodologies

- Steps in Engineering Problem Solving –

- 9. If you solve the problem with a program, **hand check the results using a simple version of the problem**. Print the results of intermediate steps.

- 10. Perform a reality check and precision check on the answer.
  - For example : Height cannot be negative or large.

Function files

- **Functions** − functions files are also program files with .m extension.

- Functions can accept inputs and return outputs.

- Internal variables are local to the function.

function **f** = fact(**n**)

End

Save as **fact.m**

Function call

>> X = fact(Y)

Syntax for Function Definition

- **Function name** - Valid function names follow the same rules as **variable names**.
  - They must start with a **letter**, and can **contain letters**, **digits**, or **underscores**.

- function y = myFunction(one,two,three) - Input arguments

- function [one, two, three] = myFunction(x) - Output arguments

- If there is no output, you can omit it.
  - function myFunction(x) or function [] = myFunction(x)

Live script editor

- Watch the demo.