ENGR 0012 – Spring 2019
HW 6

Acceptable behaviors for this assignment include:	Unacceptable behaviors for this assignment include:
• Consulting your textbook or other written material • Asking your team members • Asking your professor or TA Note that consulting materials and asking others is only acceptable as long as they do not provide you with the solutions – you have to come to the solution on your own!	• Copying the solution(s) from a solution manual, book, or other written material • Copying the solutions(s) from assignments submitted in previous semesters • Providing the solutions to a classmate, student in other section, student in future section, or online solution banks • Asking someone to complete the assignment for you

You will be creating a MATLAB script that will do the tasks described below. But first, you need to do the following:

- First step: Create a flowchart of your program. You will be submitting this electronically, so please go to www.draw.io or use any flowchart software of your choice. Please include a text box with your team number and team member names at the top. Save your file as a .pdf, .jpg, or other standard format. Do NOT submit as .xml or .html.
- Second step: Include a line of code so that the first thing your program displays is this sentence: "We in team (TeamNumber), (Team Member Names), certify that we have completed this assignment in an honest manner." (For example: "We in team L01 (Francisca, Gomy, and Jack-Jack) certify that we have completed this assignment in an honest manner."). Your assignment will not be graded if this statement is missing.

Write a MATLAB script that will plot a set of data. The script should:

1. Call the function "Header", which will display the team number and group member names.
2. From the main, ask the user to enter the name of a data file.
3. Check whether the filename exists, and continue checking indefinitely until the user provides a correct file name.
4. After loading the data file, check whether the file is a 2D data set (either a *2 by x* or an *x by 2* matrix – data stored in either rows or columns). Your code should work whether data are stored in rows or in columns.
5. Call the function "Plotting", which will plot the x - y values with the symbol and color of your choice.
    a. The function should ask the user to provide a title and x and y axis labels for this particular plot. These user inputs should display in the plot.
    b. Enter a "pause" in the program so the user can view the output of the plot, then, within the same "Plotting" function, use a menu to ask the user to select how they want to fit the data (options are linear, polynomial, semilog, or loglog).
    c. The user's menu selection should be returned to the main.
6. Depending on what the user selects, the program will call one of the following functions from the main (use a switch case):
    a. "LinearFit":
        i. Do not use the polyfit command to find the coefficients of the equation. Instead, use linear algebra to solve the equations for the best fit, as shown in the text book.
        ii. Plot the original data points using one color and the line of best fit using another color (you will need to calculate a new array of y points – do not use polyval for this), on the same plot. The title should be "Linear Fit".
        iii. Display the equation of the line on this plot.
        iv. Find the largest absolute error, and the x location associated with this error. These values should then be displayed from the main, as follows: "The largest absolute error is [*value*] and the x location is [*value*]".
        v. Calculate the r-squared value and display it on the plot.
        vi. Ask the user if they would like to find the estimated y for a given x. Error check so that the user is only able to answer 'y' or 'n'. Keep asking indefinitely until the user provides a valid response. Do not use a menu.
        vii. If the user desires to estimate y, then ask the user to provide a value for x. Calculate the y estimate by plugging in the user-provided x into the equation for the line of best fit (do not use polyval). From the function, display the estimate to screen as follows: "The estimate of y for x=[*user-provided value*] is [*estimate of y*]".
    b. "PolynomialFit":
        i. Use the polyfit command to find the coefficients of the equation. Ask the user the order of polynomial they would like, and make sure it is between 2 and 10 (error check and ask indefinitely until a correct number is entered).

ii. Plot the original data points using one color and the line of best fit using another color (you will need to calculate a new array of y points, and you can use polyval), on the same plot. The program should use at least 300 data points to plot the curve and the program should be capable of starting the curve at the smallest and largest x coordinate without user input. The title should be "Polynomial Fit".
iii. Find the largest absolute error, and the x location associated with this error. These values should then be displayed from the main, as follows: "The largest absolute error is [*value*] and the x location is [*value*]".
iv. Calculate the r-squared value and display it on the plot.
v. Ask the user if they would like to find the estimated y for a given x. Error check so that the user is only able to answer 'y' or 'n'. Keep asking indefinitely until the user provides a valid response. Do not use a menu.
vi. If the user desires to estimate y, then ask the user to provide a value for x. Calculate the y estimate by plugging in the user-provided x into the equation for the line of best fit (you can use polyval). From the function, display the estimate to screen as follows: "The estimate of y for x=[*user-provided value*] is [*estimate of y*]".

c. "SemilogFit":
i. Use the polyfit command to find the coefficients of the equation.
ii. Remember that a common problem when fitting data to exponential or power functions are data that are less than or equal to zero. The log of a non-positive number is undefined, thus, the semi-log and log-log sections should filter the data.
iii. Plot the data points (scatter plot) using one color and the line of best fit using another color (you will need to calculate a new array of y points, and you can use polyval), on the same plot. The title should be "Semilog Fit".

d. "LoglogFit":
i. Use the polyfit command to find the coefficients of the equation.
ii. As with the semilog, remember to filter out the data!
iii. Plot the data points (scatter plot) using one color and the line of best fit using another color (you will need to calculate a new array of y points, and you can use polyval), on the same plot. The title should be "Loglog Fit".

7. In the main, ask the user if they would like to enter a new set of data without ending the program. Make sure the script allows for user input error.
8. Try running your program with the data below.
9. For the linear and polynomial fits, insert the data into Excel and verify the equations and r-squared values.

Instructions for the Data

Below is a table containing two sets of data. (Data set 1 would be the x column and the data set 1 column. Data set 2 would be the x column and data set 2 column). Enter these data into two separate data files. Data set 1 should be entered as rows and named rowdata.txt. Data set 2 should be entered as columns and named colsdata.txt.

X Values	Y values – Data set 1	Y Values – Data set 2
0	1.5	-15
0.25	1.3	-5
1	1.1	5
1.25	0.9	6
2	0.75	11
3.25	0.4	25
4	0.27	40
5.5	0.25	60
6	0.1	80
7.25	0	100
8	-0.2	120
9	-0.3	160
10	-0.5	200

Include a comment with your team number and team member names at the top of every m-file.
Include comments, indentation, and whitespace so that your program is neat and understandable to anyone who reads it.

This is a team assignment. You need to submit the flowchart and the m-files. You also need to submit the data files. Name your main program and flowchart **InstructorLastName_ClassTime_HW6_TeamNumber**. For example, if you are in Dr. Mandala's 10am class, you should name your files Mandala_10am_HW6_Team5. Then, place your files in a folder, and name your folder the same way.

You will need to submit a zipped folder. To do this, follow these steps: (1) Right click on the folder, go to "Send to", then "Compressed (zipped) folder" (see Image 1), (2) Name your zipped folder the same way you named your regular folder (**InstructorLastName_ClassTime_HW6_TeamNumber**).

Incorrect file formats and/or incorrect file naming will result in point loss.

Upload the zipped folder through your class computer using the official file submission link (found on the desktop of class computers in GSCC 138 or BEH 229 at the beginning of the class when this assignment is due).

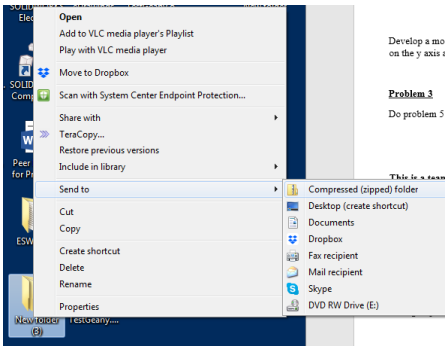

Image 1