Programming Assignment 05

Group Assignment - Counts as 2 programming assignments
Assigned: Wednesday 24 September
Due: By start of class, Wednesday 8 October

Problem: A common engineering activity is to identify an appropriate equation that describes the relationship between a dependent variable and independant variable(s).

Your task: Design, code, and debug a MATLAB script that will
   (1)   ask the user for a data file name that contains the (indep,dep) data set, open the data set and extract the independent and dependent data points into separate independent and dependent vectors;
   (2)   ask the user what type of plot to display (linear, semilog, loglog, polynomial, spline);
   (3)   display the requested plot showing the data as discrete points and the requested fit as a line;
   (4)   ask whether the plot is suitable and, if not, recycle through steps (2) and (3) until an acceptable plot is displayed; and
   (5)   write to the screen the resultant choice (linear, semilog, loglog, polynomial, or spline), its associated equation (unless it is a spline, in which case, the equation is not provided), the total error of the fit, and the maximum error and its independent variable location.

(1)   Step 1 is to be a **function** that (1) requires (needs) nothing from the script; (2) asks the user for the file name; (3) opens the file and extracts the independent and dependent data as row vectors; (4) asks for the independent variable, dependent variable, and data set names; (5) asks for the symbol type and color; and (6) returns (results) the independent and dependent data vectors, the independent variable name, the dependent variable name, the data set name, and symbol type.

(2)   Step 2 is to be done using the **menu** command.

(3)   Each possible display is to be done by a separate function that (1) requires (needs) the independent and dependent data vectors, the independent axis label, the dependent axis label, the graph title, and symbol type; (2) computes the desired fit; (3) displays the both the original data and the newly calculated fit; (4) computes the total error and maximum error and its location. (5) Each function should return (results) any coefficients associated with the equation fit, the total error, and the maximum error and its independent variable location. **Note: there will be five functions, one for each possible display.**
        The function that performs the polynomial fit should ask for the degree of the polynomial to fit the data with (up to length(ydata)) and show that fit.

(4)   Step 4 is most easily accomplished by an **if/elseif** or **switch/case** nested inside a **while** loop in the main script. The control variable for the decision structure should be the plot type selected. The control variable for the **while** loop should be whether the plot is acceptable.

(5)   Step 5 can be a single function that displays the requested information to the screen or a decision structure that calls an appropriate display function based upon the fit type.

See sections 4.12-4.14 of Introduction to Engineering notes.

Note on functions in step 3: log(0) and log(neg number) will create problems for the semilog and loglog displays. You will need to search the data to remove any (x,y) pairs that will create this problem.

Test your script with the following data (found in **pa05dat.dat**) by finding the best fit to each data set separately. X is the independent variable and R, S, T, and Z are different dependent variables.

X	R	S	T	Z
1.0	1.5	-4.0	13.00	25.0
3.0	5.0	-3.0	11.00	70.0
5.0	10.0	-1.0	8.00	85.0
7.0	15.0	1.0	3.00	40.0
10.0	25.0	2.0	2.20	10.0
12.0	35.0	3.0	1.50	-5.0
13.0	40.0	5.0	0.75	-26.0
15.0	50.0	7.0	0.45	-35.0
17.0	58.0	9.0	0.30	-6.0
20.0	77.0	11.0	0.10	10.0
23.0	90.0	13.0	0.05	60.0
27.0	110.0	14.0	0.04	90.0
30.0	122.0	17.0	0.02	45.0

Use EXCEL to independently verify the results of your MATLAB script.

Turn in:
1.   An outline of your program approach.
2.   A printed copy of your script and any associated functions and a disc containing same.
3.   Printed copies of the MATLAB graphs from each data set showing the data and best fit line.
       Hand write the following on the graph
              MATLAB equation:
              EXCEL equation:
              total error:
              maximum error:
              x-location of the maximum error:
       and provide the information. Be sure to put your names, assignment number, and date on the printed copy.
4.   A separate (typewritten) piece of paper that answers the following questions:
              What can you conclude from the polynomial fits?
              What happens to the polynomial fits as you increase the order of the polynomial?

Programming Assignment 05 - Evaluation Criteria

Name(s) _____

Criteria	Points Available	Points Awarded
Script Requirements		
Fcn to get plot info	10	
Menu for plot type	10	
Separate fcn for each plot (5)	50	
Fcn(s) to display fit results	20	
While loop to find best fit	10	
Output		
Script ran with at least 1 fit	40	
Plots agrees with printouts (4)	20	
Plots properly annotated	20	
Fit results correct (4 data sets)	40	
Excel info provided (4 times)	20	
Questions answered	10	
Points to lose total		
	Total Pts:	/250

Points to Lose Criteria	Max Points	Points Lost
Header does not display	10	
Header missing from any function	10	
Variable dictionary missing from any function	10	
Names not meaningful	10	
Poor whitespace/readability	10	
Poor commenting	10	
Poor user interface	10	
	Total Pts:	