Problem Solving for Engineering Transfer
ENS 1300
Lab 6

Create a MATLAB file entitled Lab07_LastnameFirstname.m
Each script file you turn in should have the following information at the beginning of the file (as comments):

- % Assignment name
- % Your name, and section
- % Date

Each major section of code in the script file should be separated by a blank line (%%) and include the following:

- clc; clear all; close all
- % Project Description / Problem Statement
- %Comments outlining the solution method

Problem 7_2.1 Use the MATLAB polynomial commands that were covered in the EF230 videos to complete each of the following:
(a) given a = $x^3 - 3x^2 - 2x + 6$, find the values of x where a = 0

(b) given b = $2x^2 - 4x + 3$, determine the value of b when x = 3

(c) given c = $2x^4 + 3x^2 - x + 4$, plot c vs x for x=0 to x=5 with x increments of 0.1

(d) Determine the general equation (coefficients of the equation) for the slope of c and name it dcdx. Find the value of the slope at c = 2.5, and name it dcdxVal.

(e) Using the same equation, c =$2x^4 + 3x^2 - x + 4$, determine the general equation (coefficients of the equation) for the area under the curve and name this equation cint. It is known that at x=0, cint = 6. Find the value for cint from x=2 to x=4 and name it cintVal

(f) Given the function d= (x+1)(x-3)(x-5), generate the polynomial expression (coefficients of the equation) for d and name it d

Problem 7_2.2 Use MATLAB commands that were covered in the videos to complete the following:

The flow rate in a river on a particular day is shown below. The time is measured in hours and the water flow rate is measured in cubic feet per second. This data will be plotted using three different curve fitting options

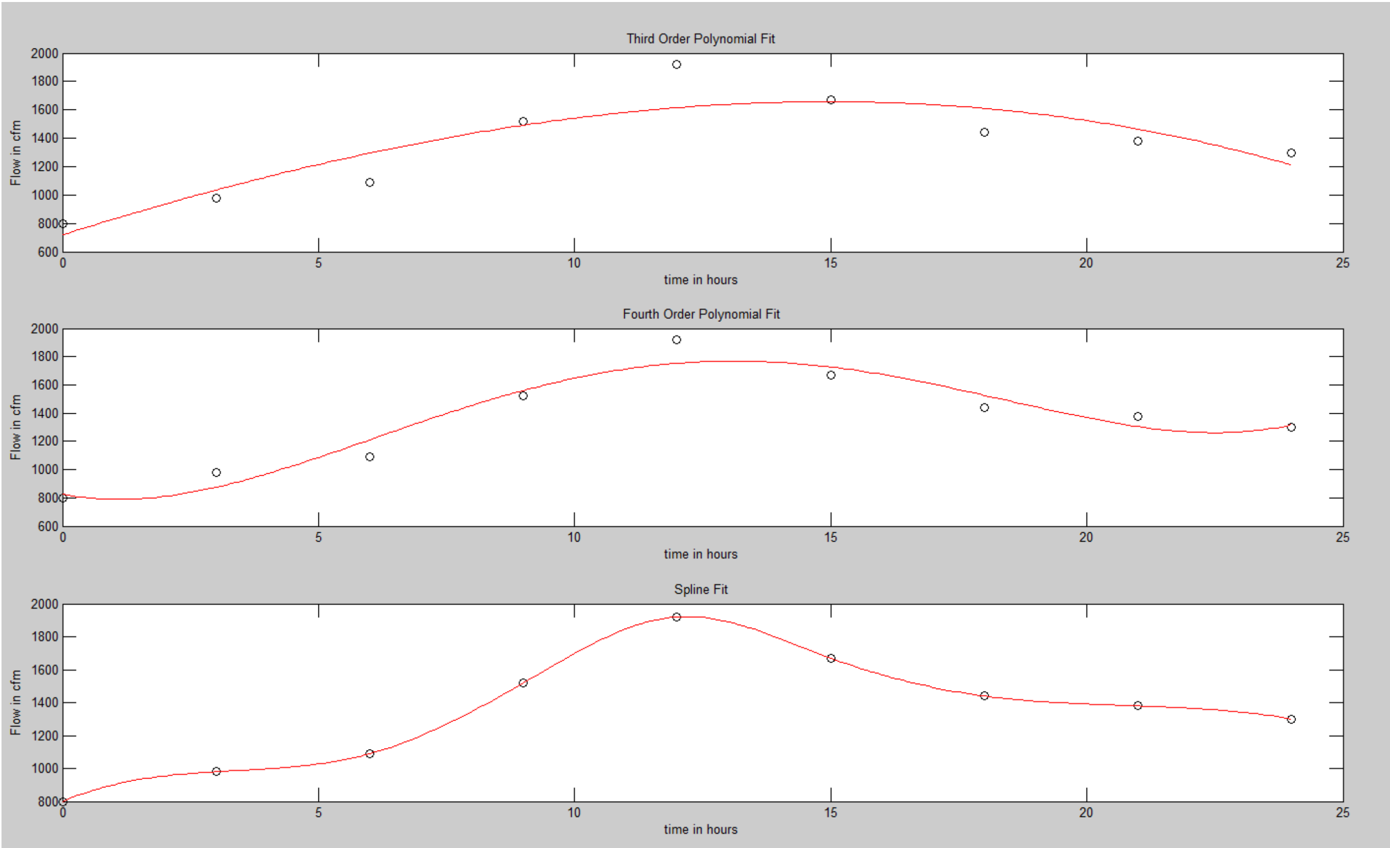
First Method: Write a script that will fit a polynomial of degree 3 to the data. Plot the original data points and this 3rd order polynomial onto a single plot. When generating the values for the plot, use time values to be from 0 to 24 in increments of 0.1 (this will create a much smother plot than if you use the 9 times given in the data. See below for more information on plotting specifics for all three methods)

Second Method: Next, fit the same data to a polynomial of degree 4 Using the subplot command, show the plot of the original data and the fourth order polynomial in the same figure window. Again, for the plot, create values for time from 0-24 in increments of 0.1.

Third Method: Fit the same data by using the cubic spline method. Using the subplot command, show the plot of the original data and the spline fit in the same figure window as the above two methods. Again, for the plot, create values for time from 0-24 in increments of 0.1.

PLOTTING SPECIFICS
For all the plots (that are in the same figure window-see below for an example), plot the original data as a black circle and the best fit curves as red lines. The titles for subplots should include the method used. The x and y labels for the plots should be titled appropriately with units included.

time: 0 3 6 9 12 15 18 21 24
flowrate: 800 980 1090 1520 1920 1670 1440 1380 1300



7_2.3 Curve fitting tool

Given x and y below, determine the best fit for this data using the curve fitting tool available on the plot window.

X=[1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16 17 18 19 20]

Y= [-3 8 47 132 281 512 843 1292 1877 2616 3527 4628 5937 7472
9251 11292 13613 16232 19167 22436]

In order to do this:

a) plot the data
b) go to the figure window
c) click on tools
d) click on basic fitting
e) check show equations, plot residuals, and show norm of residuals
f) by clicking on the different types of curves and using the plot residuals, determine the best fit.

In a comment in your MATLAB code, write the equation that best fits this data