AIN SHAMSUNIVERSITY
FACULTY OF ENGINEERING
Credit Hours Engineering Programs - CHEP
Mechatronics and Automation Engineering & Computer Engineering and Software Systems Programs
Final Project

Spring 2020 ***Due Date :*** **June 11, 2020**

CSE122 & CSE131 & CSE125: Computer Programming & Computer Programming (I)

Total Marks: 40 Marks

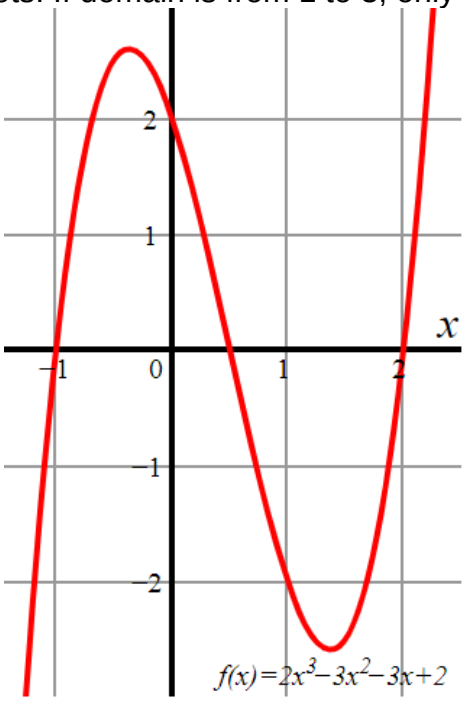
Project Description

Root finding is one of the most important topics for several engineering specializations. It is used in automatic control design as well as in solving optimization problems. The latter topic is very crucial in machine learning. In this project, we are going to solve the following root finding case:-

$$f(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \cdots + a_1 x + a_0 = 0$$

The requirements will be as follows:-

1. The user must input the polynomial as an input string. Then your program makes sure it is in correct format and hence finds the order n and the coefficients a_i. Coefficients will be stored in a dynamic array. An example of the input will be a string as follows:-
   5x^3 - x^2 + 2.5x + 1…this means a third order polynomial with coefficients of 5, -1, 2.5, and 1. The program will print three roots. The program will detect any error encountered with the user input. The following are error examples:
   5x^3 - x^2 + 2.5x +
   5x^3 - x^ + 2.5x + 1
   5x^3 - x2 + 2.5x + 1
2. The program will print all the real roots of the polynomial found in a domain that is entered by the user. An example is given in the following graph. If the user enters domain of -5 to 5, the program must output three roots. If domain is from 1 to 3, only one root will be displayed.



3. The students will demonstrate the use of pointers, strings, and different arithmetic and mathematical operations or algorithms used in their implementations.

4. Ten different testing cases must be demonstrated with validated roots to show the efficiency of the implemented program.
5. A detailed technical report must be provided in addition to the codes included in the appendix.
6. This is an individual assignment. So, plagiarism is prohibited. Copying codes from the internet will result in getting big zero.
7. Your project should be submitted on LMS by the due date (Thursday, June 11th, 2020).