

National University of Computer and Emerging Sciences

School of Computing
Campus

Fall 2021

Islamabad

MT1003 : Calculus and Analytical Geometry (Fall 2021)

Final Project

(Deadline: 10th December , 2021 11:59 PM)

Deadline: Deadline to submit the project is **10th December, 2021 11:59 PM**. Late Submission Policy for the Project

1. Submission within 1 Hour after the deadline = 20% Deduction of Marks
2. Submission between (1-24) Hour after the deadline = 40% Deduction of Marks
3. Submission after 24 Hours of the deadline = 0 Marks (No Acceptance).

Correct and timely submission of project is the responsibility of every student; hence no relaxation will be given to anyone.

Submission: Please follow the following submission instructions. Failure to submit according to the above format would result in deduction of 10% marks. Submissions on the email will not be accepted.

- i. Create a .cpp file and write your whole code in that file . You have to write user defined functions for each independent task your project is performing. Name the .cpp file as RollNumber_Section.cpp . For Example :- **i210494_U.cpp**

**** No submission format other than .cpp is acceptable .**

Plagiarism: Plagiarism in the project will result in zero marks in the project (or may be an F grade in the course). A code is considered plagiarized if the code is not your own work.

Comments & Indentation : Submission of properly indented and commented code is highly appreciated .

Quadratic Regression is one of many Machine Learning algorithms used in Data Science . It is basically the process of finding equation of the parabola that best fits a set of data in order to predict real valued features . As a result, we get an equation of the form : $ax^2 + bx + c$. It uses a training set to construct the cost function for that particular regression problem. The cost function represents optimization objectives i.e. minimize it so that we can develop an accurate model with minimum error.

The Management of FAST has hired the DS Batch 21 students in order to get optimized cost required for the construction of a new building on the basis of the following cost function **$ax^2 + bx + c$** . As a part of your job , your responsibility is to write a .cpp program that takes the values of a, b & c as signed integers from the user and performs the following tasks .

1. Create the table on set of set of input **$x = [-4, -3, -2, -1, 0, 1, 2, 3, 4]$**
2. Plot the graph i.e., parabola using the table created in part(i) .
3. Calculate the first derivative of the function .
4. Find the first derivative of the function and use that to evaluate the extreme value .
5. Using the second derivative , tell that the extreme value calculated is minima or maxima.

Sample Output :-

```
buzdar@Desktop-Buzdar:/mnt/c/ubuntu$ g++ project.cpp
buzdar@Desktop-Buzdar:/mnt/c/ubuntu$ ./a.out
Enter values of a :
1
Enter values of b :
0
Enter values of c :
1
The Equation becomes : 1*x^2 + 0*x^1 + 1
The Table used for drawing the graph is :
-----
| x | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | 17 | 10 | 5 | 2 | 1 | 2 | 5 | 10 | 17 |
-----
The graph of the function entered is :
*
*
*
*
*
*
*
*
First Derivate : 0*x^2 + 2*x^1 + 0
From 1st derivate , extereme point lies corresponding to x = 0
Second Derivate : 0*x^2 + 0*x^1 + 2
From 2nd derivate , extereme point is a MINIMA
```

Best of luck!