

CS 101

Project Report

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INTRODUCTION

This project aims to let the users perform certain operations on functions they input like finding its integral(both definite and indefinite), finding its derivative at a point, plotting its graph, finding zeroes of a polynomial etc.

BASIC OPERATIONS TO BE COVERED IN THE PROJECT

- a. Calculation of Definite Integral
- b.
- c. Finding Gradient at a point
- d. Finding Directional derivative
- e. Finding Tangent plane and Normal(3D)
- f. Calculate Derivative at a point
- g. Finding the 1st Derivative
- h.
- i. Finding the Normal and Tangent(2D)
- j.
- k.

General:

The definite integral of a function in an interval $[a,b]$ gives the signed area between the curve and x-axis from $x=a$ to $x=b$.

In mathematics, the directional derivative of a multivariate differentiable function along a given vector \mathbf{v} at a given point \mathbf{x} intuitively represents the instantaneous rate of change of the function, moving through \mathbf{x} with a velocity specified by \mathbf{v} . It therefore generalizes the notion of a partial

derivative, in which the rate of change is taken along one of the coordinate curves, all other coordinates being constant.

Plan :

After an initial confusion on deciding the topic of the project ,we came to the conclusion that a Calculus tools project will be better and so we fixed it. Then, after conducting a certain amount of online research and consultation with our TA, we understood the nature of the projects and it's requirements. Then, the basic outline of the program, including the algorithms and libraries that are going to be used were discussed upon and finalised.

After stage 1 submission we divided work among all the teammates and started our work. We faced lots of problem in making external libraries work. Also, code which worked perfectly in one person's laptop didn't work at all in others' and vice-versa. Individual work got finished in time, and everyone did their work properly.

Limitations:

-Integration

Although our program can do definite integration, we can't do indefinite integration i.e we can't find the antiderivative function of a given function.

-Differentiation

The program assumes that the function has finite number of non differentiable points

Numerical differentiator doesn't have limitations

Limitations of symbolic differentiator :

1. The symbolic expressions are not reduced to the simplest form.
2. Division operator has not been defined.
3. In $(base)^{exp}$, exp needs to be a positive integer
4. Cannot handle functions which have more than 2 expressions in product eg. $(expression1)*(expression2)*(expression3)$
5. Invalid input causes undefined behaviour.

External Links:

- <http://en.wikipedia.org/wiki/Integral>
- <http://en.wikipedia.org/wiki/Gradient>
- http://en.wikipedia.org/wiki/Directional_derivative
- http://en.wikipedia.org/wiki/Newton's_method

