

# User Manual

## Introduction

This project is about calculating integral and derivative of some standard function and plotting their graph using slope calculation and other tools of calculus.

### **Salient feature of our project –**

#### **2d**

Calculating integral of function.

Calculating the functional form of 1st derivative of a function.

Finding the equation of a tangent and a normal at a point.

Plotting the function and any required tangent, normal graphically.

#### **3d**

Calculating the directional derivative of a function.

Calculating gradient of a function.

Finding the equation of tangent plane.

## User Interface

### **Ø Opening window displays two option 2d and 3d**

- 2d window –**Options**: integrator, differentiator, calculate value of function, solve polynomial, plot graph.
  - § Calculate value of function- **Input**: Function and the value of x, **output**: value of function
  - § Solve Polynomial- **Input**: Polynomial, output-roots of polynomial.
  - § Plot Graph- Input function, output-Graph of function.
  - § Integrator- **Input**: function and the limits of integral. **Output**: value of integral. And showing graphically limits and the area under the function.  
**Output** -Ask more options-to plot the answer, plot original function.
  - § Differentiator-**Options**\_Slope at a point, nth derivative.
    - Slope at a point-**Input**: function and the points. **Output**: the value of derivative the graph of function, the graph of function with the tangent to the specified point.

- 1st derivative- **Input:** function, point, **Output:** the value of derivative.
- Output** -Ask more options-to plot the answer, plot original function.
- 3d window-**Options:** Integral, gradient, directional derivative, equation of tangent plane, maxima and minima.
  - § Calculate value of function- **Input:** Function and the value of x, **output:** value of function
  - § Plot Graph- Input function, output-Graph of function.
  - § Integral-**input:** two variable function **output**-value of integral (volume under the surface).
    - Output** -Ask more options-to plot the answer, plot original function.
  - § Gradient-**Input:** function, **output:** gradient.
  - § Directional derivative-**Input:** function and direction vector, **output:** value of directional derivative.
  - § Equation of tangent plane-**input:** coordinate of x and y, **output:** equation of tangent plane
    - Output** -Ask more options-to plot the answer, plot original function.

String format for numerical differentiator:

- 1.Works for trigonometric,logarithmic,exponential and algebraic
- 2.Brackets need to be put around variable with respect to which derivative is being evaluated  
eg.  $(x)^3$ , $\sin(x)$ , $\log(x)$ , $\exp(x)$
- 3.Input expressions must have no spaces

String format for plotting graphs:

- 1.Works on trigonometric,logarithmic,exponential,algebraic,absolute,hyperbolic, and many more types of functions.
- 2.Brackets need to be put around variable,eg.  $\sin(x)$ , $\exp(x*x)$ , $\log(\cosh(\text{abs}(x)))$ ,etc
- 3.Powers of x have to be written in the form of products of x, like  $x*x*x*x$ .

For finding roots of a function, you need to provide the function, and a range. The range is an arbitrary range which just helps the program to find roots. There's no recommendation as to what this range should be, any range which possibly contains a root is better than one which doesn't.

For plotting tangents, you need to give the point at which to plot tangent, the function, and the range of the graph.