AMRITA VISHWA VIDYAPEETHAM | School of Engineering
Chennai Campus

Department of Computer Science and Engineering

23MAT206- Optimization Technique Lab

Title of Experiment

3. Numerical Methods for Finding Ordinary and Partial Derivatives Using MATLAB

Name of the Student	
Registration Number	
Date of Submission:	

Assessment Rubrics

Description	Marks Allotted	Marks Secured
Objective and Procedure	2	
Mat lab Code & Final Results	4	
Responses to the Exercise Problems	4	
Total Marks	**10**	

Course Faculty

Numerical Methods for Finding Ordinary and Partial Derivatives Using MATLAB

AIM:

PROCEDURE:

Exercise

Q1. Given the function $f(x) = ln\,(1 + x^2)$, use the MATLAB code to predict the derivative at a future point. Take $x_0 = 1$, step size $h = 0.1$, and number of steps $n = 3$. Compute the forward, backward, and central difference approximations at $x_1 = x_0 + n \cdot h$. Compare the results with the analytical derivative $f'(x) = \frac{2x}{1+x^2}$.

MATLAB CODE AND RESULTS

OUTPUT:

```
Enter 1 for ordinary derivative f(x), 2 for partial derivative f(x,y): 1
Enter the function f(x): log(1+x^2)
Enter the initial point x0: 1
Enter the step size h: 0.1
Enter the number of steps forward (n): 3

Ordinary Derivative at x = 1.30000
Forward Difference Approximation : 0.95648
Backward Difference Approximation: 0.97543
Central Difference Approximation : 0.96596
>>
```

Q2. Consider the function $f(x, y) = x^2 \cdot e^y + y^2 \cdot cos\,(x)$. Use the MATLAB code to predict the partial derivatives at the future point $(x1, y1) = (x0 + n \cdot h, y0 + n \cdot h)$ with $x_0 = 0,\ h = 0.05$, and n=20. Compute ∂f/∂x and ∂f/∂y using central differences and compare with the exact partial derivatives.

MATLAB CODE AND RESULTS

OUTPUT:

```
Enter 1 for ordinary derivative f(x), 2 for partial derivative f(x,y): 2
Enter the function f(x,y): x^2*exp(y) + y^2*cos(x)
Enter x0: 1
Enter y0: 1
Enter the step size h: 0.05

Partial Derivatives at (x, y) = (1.00000, 1.00000)
∂f/∂x ≈ 4.59544
∂f/∂y ≈ 3.80002
>>
```