

## **Department of Computer Science and Engineering**

## 23MAT206- Optimization Technique Lab

### **Title of Experiment**

## 3. <u>Numerical Methods for Finding Ordinary and Partial</u> <u>Derivatives Using MATLAB</u>

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

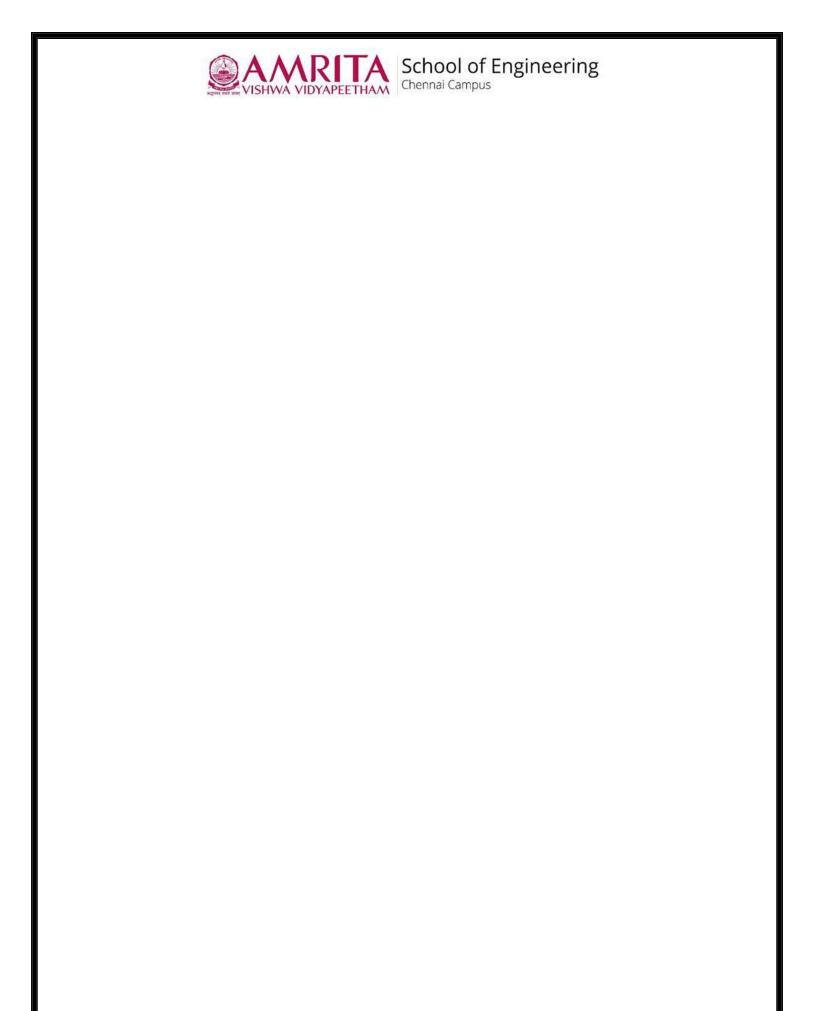
AIM:			
PROCEDURE:			

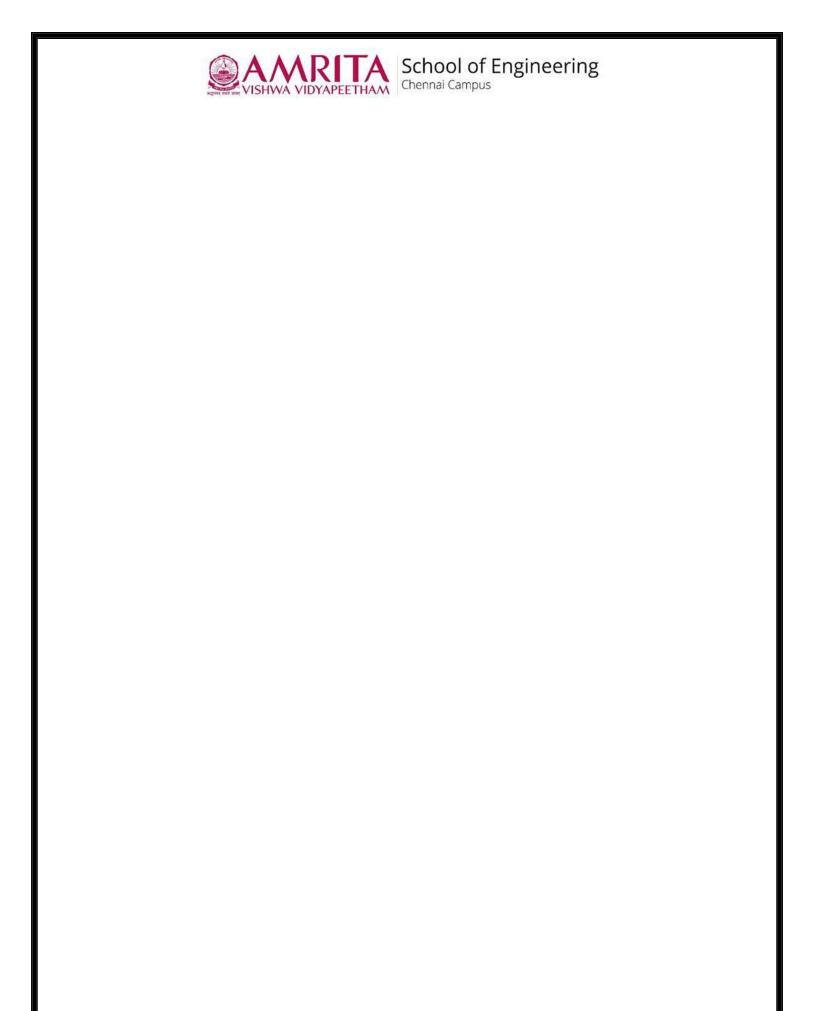


#### **Exercise**

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







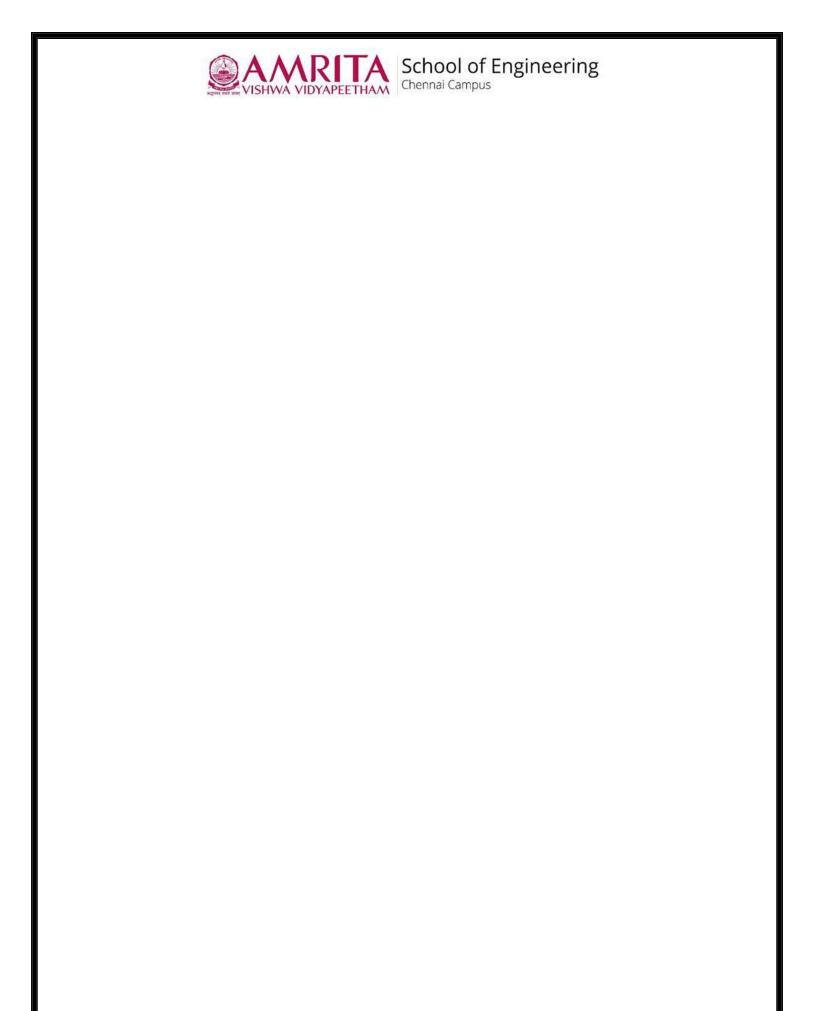
#### **OUTPUT:**

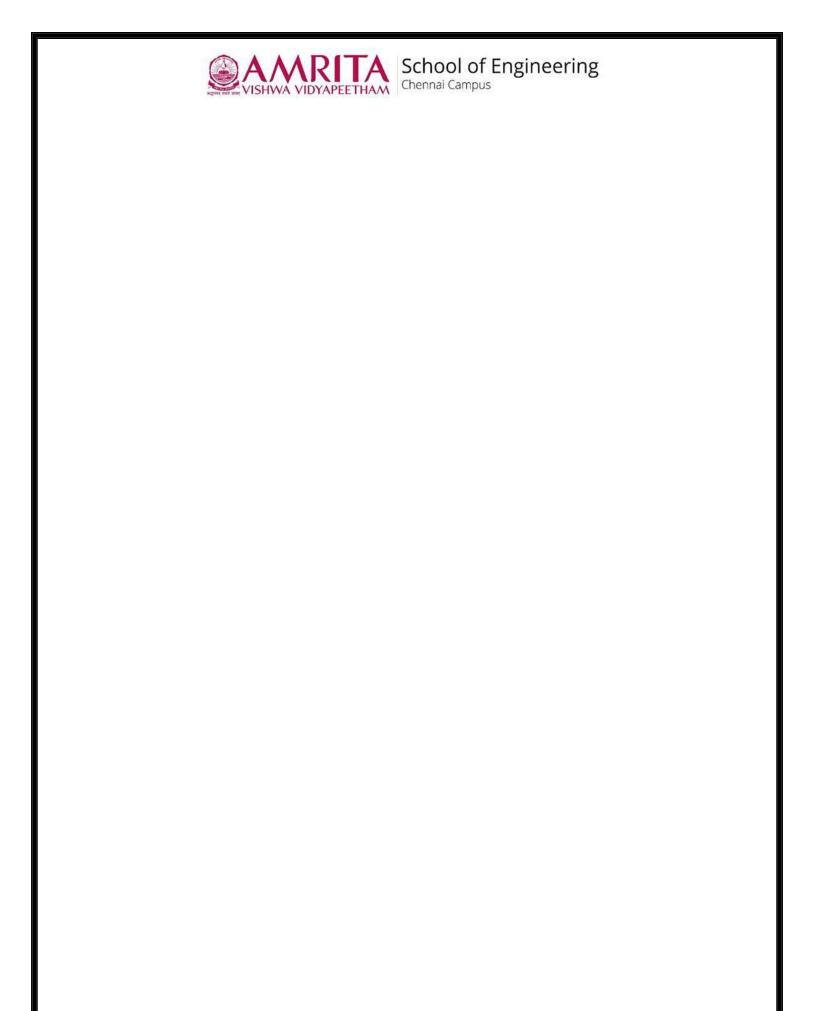
```
Enter 1 for ordinary derivative f(x), 2 for partial derivative f(x,y): 1 Enter the function f(x): \log(1+x^2) Enter the initial point x0: 1 Enter the step size h: 0.1 Enter the number of steps forward (n): 3 Ordinary Derivative at x = 1.30000 Forward Difference Approximation: 0.95648 Backward Difference 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  $\partial f/\partial x$  and  $\partial f/\partial y$  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) \partial f/\partial x \approx 4.59544 \partial f/\partial y \approx 3.80002 >> |
```