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MA-221(Numerical Analysis)
Course Instructor: Prof. Rajendra K. Ray
Lab Assignment-3
Date: 11/02/2025

Provide the code for the following problems:

1. Calculate the real roots of the following equations with the error tolerance $\epsilon \leq 10^{-8}$ using the bisection and regula-falsi method:

   (a) $2x^6 - 5x^4 + 2 = 0$

   (b) $e^x - 3x^2 = 0$

   (c) $x - \tan x = 0$

   (d) $ln(1 + x) - \cos x = 0$

   Compare the computed results by both the methods.

2. In machine learning, the optimal learning rate η minimizes the loss function:

$$L(\eta) = 100e^{-\eta} + 10\eta^2 - 50 \tag{1}$$

   Find the learning rate η from $L(\eta) = 0$ using

   (a) Bisection Method

   (b) Regula-Falsi Method

   Use the interval $[0, 1]$ and compute η correct upto 10 decimal places.

3. Apply the bisection and regula-falsi method to find $\sqrt{N}$ and $N^{1/7}$, where N is a positive real number.