MTP 290: ASSIGNMENT

15 Marks total

Format for submission–
(i) Students should upload on moodle a folder named "YOURNAME-Solutions" which contains the completed scripts and functions for the assigned MATLAB exercises: all the scripts should be in one folder, with each script preceded by a comment line which indicates the question number; each function .m file should contain a comment line which indicates the question number and brief description.

(ii) Together with MATLAB script you should also submit results/solutions of all the assignment problems documented, preferably in a pdf file.

(iii) The numerical results together with the implemented codes need to be submitted on or before **April 9, 2024**.

Write MATLAB scripts to solve the following problems:

Problem 1 [5 marks] Consider the IVP

$$y' = 2xy^2, \ y(0) = 0.5.$$

Use modified Euler's method with h = 0.1 to obtain the approximation to $y(1)$.

Problem 2 [5 marks] Given the initial value problem

$$y' = \frac{2y}{x} + x^2 e^x, \quad 1 \le x \le 2, \quad y(1) = 0,$$

with exact solution $y(x) = x^2(e^x - e)$, use Runge-Kutta method of order 4 with $h = 0.1$ to find the approximate solution. Also compute the true error at each node.

Problem 3 [5 marks] Use finite difference method with $h = \frac{\pi}{16}$ to solve the following boundary value problem

$$y'' + y = 1,$$
$$y(0) = 1, \ y(\pi/2) = 0.$$