MTP 290—ASSIGNMENT 2

Problem 1. Use Euler and improved Euler method to solve

$$y' = y - y^2,\ y(0) = 0.2.$$

Use 10 steps and $h = 0.1$.

Problem 2. Write a MATLAB code to solve

$$y' + y\tan x = \sin 2x, \quad y(0) = 1,$$

using classical Runge–Kutta method of fourth order. Use $h = 0.2$ and $h = 0.1$ to find $y(1)$.

Problem 3. Solve the initial value problem

$$y' = x + y \quad y(0) = 0$$

by Adams–Bashforth Prediction and Adams–Moulton Correction method on the interval $0 \le x \le 2$, choosing $h = 0.1$.

Problem 4. Use Trapezoidal rule and Simpson's rule with 10 ordinates to find an approximate value for the integral

$$\int_1^5 \sqrt{1 + x^2}\, dx.$$

and compare the error with error graphs.

Problem 5. Approximate the integral of $f(x) = x^3 + 5x^2 + 1$ on the interval $[1\,, 5]$ by using composite trapezoidal method

(a) with four sub intervals,
(b) with eight sub intervals,
(Which approximation is much closer to the correct answer)
(c) Compute the true error in both the cases.

Extra questions for all

Problem sp1. Compare the Secant root finding method with Newton's root finding method using a code. (Mention at-least two advantages/disadvantages. Use suitable functions.)

Problem sp2. Find the Doolittle's factorization for the following matrix.

$$\begin{bmatrix} 1 & 2 & -1 \\ 2 & 2 & 3 \\ -1 & -3 & 0 \end{bmatrix}$$

Note.

- For each problem, you need to write Matlab codes. Proper documentation should be used in the programs.
- You have to submit all the codes.
- No cheating allowed.