

Assignment

Solve all problems while demonstrating each step clearly. The Assignment is worth a total of 10 points.

Consider the initial value problem (IVP) given by the following differential equation: $\frac{dy}{dt} = f(t, y) = t - y$ with the initial condition: $y(0) = 1$. Solve this IVP using the Euler, Heun (Improved Euler), and Runge-Kutta (4th order) methods over the interval $t \in [0, 2]$ with a step size $h = 0.1$. Compare the numerical solutions obtained from each method with **ten** steps with the exact solution.

- (2 pts) 1. Implement the Euler method to solve the given IVP.
- (2 pts) 2. Implement the Heun method to solve the given IVP.
- (4 pts) 3. Implement the Runge-Kutta method (4th order) to solve the given IVP.
- (2 pts) 4. Write a python code to check your results and plot all the numerical solutions (the three) along with the exact solution in one graph.