

Assignment 4

Exercises

1. Apply Euler's method with $h = 0.1$ to approximate the solution of

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

at $x = 0.1, 0.2, 0.3, \dots, 0.5$. Compare with exact solution $y(x) = 2e^x - x - 1$.

2. Use the **Modified Euler** method with $h = 0.2$ to solve

$$y' = y + \cos x, \quad y(0) = 1,$$

for $x = 0.2, 0.4, 0.6$.

3. Using the **Runge-Kutta method of order 4** with $h = 0.25$, approximate the solution of

$$y' = xy + x^3, \quad y(0) = 1,$$

for $x = 0.25, 0.5$.

4. (Comparison Exercise) Solve the IVP

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

using Euler, Modified Euler, and RK4 methods with $h = 0.5$ up to $x = 2$. Present results in a tabular form and compare errors with exact solution

$$y(x) = e^{-2x} + \frac{1}{3}e^{-x}.$$