
Show work. You need to use calculators, Maple, or any other computing software, but show the intermediate results in a table.

Student’s name __________

1. Use Euler’s method to find approximations to the solution to the initial value problem

\[ y' = 1 - \sin y, \quad y(0) = 0 \]

at \( x = \pi \), taking 1, 2, 4, and 8 steps.

2. Use Euler’s method with \( h = 0.1 \) to approximate the solution to the initial value problem

\[ y' = x - y, \quad y(0) = 0 \]

on the interval \( 0 \leq x \leq 1 \). Do the same using the improved Euler’s method.

Find the actual analytic solution.

Compare these two approximations with the actual solution by graphing the polygonal-line approximations and the actual solution on the same coordinate system.

3. Use the fourth order Runge-Kutta’s method with the step size \( h = 0.1 \) to approximate the solution to the initial value problem

\[ y' = 1 - y, \quad y(0) = 0 \]

at the points \( x = 0, 0.1, 0.2, ..., 1 \).

Solve the equation exactly and compare the values of the approximate and exact solutions at these points.

Use your answers to sketch both solutions on \([0, 1]\).