

Math 308–200. Spring 2011. HW #4. 15 points. Due March 3rd.

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. (Section 1.4., 5 points)

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. (Sections 1.4, 3.6, 5 points)

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. (Section 3.7, 5 points).

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 $x = 0, 0.1, 0.2, \dots, 1$.

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 $[0, 1]$.