

Predictor-Corrector Homework

1) Write and test a computer program to solve the initial value problem:

$$\begin{cases} x' = x + x^2 \\ x(1) = \frac{e}{16-e} \end{cases}$$

over the interval $[1, 2.77]$ with $h = .01$. The program will use a predictor-corrector scheme with the trapezoid method as corrector and Euler's method as predictor. Test both (a) one step of Euler's method as predictor and (b) the more accurate version with two steps of Euler's method as predictor. Plot the true solution ($x(t) = \frac{e^t}{16-e^t}$) and solution you obtain from both (a) and (b) on the same graph clearly labeling which is which. Also, by trying successively smaller values of your step size h , create two tables to estimate the rate of convergence you see numerically from (a) and (b).