

ASSIGNMENT 4 - due 24 March, 2016

1. The boundary-value problem

$$y'' = y' + 2y + \cos x, \quad 0 \leq x \leq \frac{\pi}{2},$$
$$y(0) = -0.3, \quad y\left(\frac{\pi}{2}\right) = -0.1$$

has the solution $y(x) = -\frac{1}{10}(\sin x + 3 \cos x)$. Use the linear shooting method with $h = \frac{\pi}{8}$ to approximate the solution, and compare the result to the exact solution. Use the modified-Euler method to solve the initial value problems.

2. Use the nonlinear shooting method with $h = 0.5$ to approximate the solution to the boundary-value problem

$$y'' = -(y')^2 - y + \ln x, \quad 1 \leq x \leq 2,$$
$$y(1) = 0, \quad y(2) = \ln 2.$$

Use the modified Euler method to solve the initial value problems. Carry out 2 Newton iterations starting with $t_0 = \ln 2$ (you need to solve the initial value problems with $t = t_0$, t_1 and t_2). Compare the solution obtained using $t = t_2$ to the exact solution $y = \ln x$.