MTH 538 Homework 2

Problem 1

Determine the value c that will make the multistep method $y_{j+2} = -4y_{j+1} + 5y_j + chf_{j+1} + 2hf_j$ consistent.

Problem 2

Find a two-step, third order explicit method. Determine if the method is stable.

Problem 3

Apply the shooting method to the linear BVP. Begin by finding an interval $[s_0, s_1]$ that brackets the solution. Use Bisection method to find the solution. Plot the approximate solution on the interval,

$$y'' = 3y - 2y', y(0) = e^3, y(1) = 1,$$

find the exact solution, and compare to the approximate numerical solution obtained. You may use any numerical method to solve the IVP.

Problem 4

Use finite-differences to approximate solutions to the nonlinear BVP for n = 9, 19 and 39,

$$y'' = 18y^2,$$

 $y(1) = 1/3,$
 $y(2) = 1/12.$

Plot the approximate solutions together with the exact solution $y(t) = 1/(3t^2)$ and display the error as a function of t in a separate semilogarithmic plot.