UMC 202
PROBLEM SET 8

(1) Apply the Linear Shooting technique with $N = 10$ to the boundary value problem

$$y'' = \frac{-2}{x}y' + \frac{2}{x^2}y + \frac{sin(ln\,x)}{x^2}, \text{ for } 1 \le x \le 2,$$
$$\text{with } y(1) = 1 \text{ and } y(2) = 2,$$

and compare the results to those of the exact solution

$$y = c_1\,x + \frac{c_2}{x^2} - \frac{3}{10}sin(ln\,x) - \frac{1}{10}\,cos(ln\,x),$$

where $c_1 = 1.13921$ and $c_2 = -0.03921$.

(2) Apply the shooting method with Newton's method to the boundary value problem

$$y'' = \frac{1}{8}(32 + 2x^3 - yy'), \text{ for } 1 \le x \le 3,$$
$$\text{with } y(1) = 17 \text{ and } y(3) = \frac{43}{3}.$$

Use $N = 20$, $M = 10$ and $TOL = 10^{-5}$, and compare the results with the exact solution $y(x) = x^2 + \frac{16}{x}$.

(3) Use the linear finite difference algorithm with $N = 9$ to approximate the solution to problem 1 and compare the results obtained in the linear shooting method.