

Advance Numerical Technique Laboratory

Lab 2

Q.1 Solve this boundary value problem using shooting method and classical runge kutta method.

$$y'' = x + y$$

$$y(0) = 0$$

$$y(1) = 0$$

$$h = 0.25$$

Solution :-

Trigonal Matrix

$$\begin{bmatrix} -33 & 16 & 0 \\ 16 & -33 & 16 \\ 0 & 16 & -33 \end{bmatrix} Y = \begin{bmatrix} 0.25 \\ 0.50 \\ 0.75 \end{bmatrix}$$

$$Y = \begin{bmatrix} -0.349 \\ -0.0563 \\ -0.05 \end{bmatrix}$$

$$\text{Plot} = \begin{bmatrix} 0 & 0 \\ 0.25 & -0.349 \\ 0.50 & -0.0563 \\ 0.75 & -0.05 \\ 1 & 0 \end{bmatrix}$$

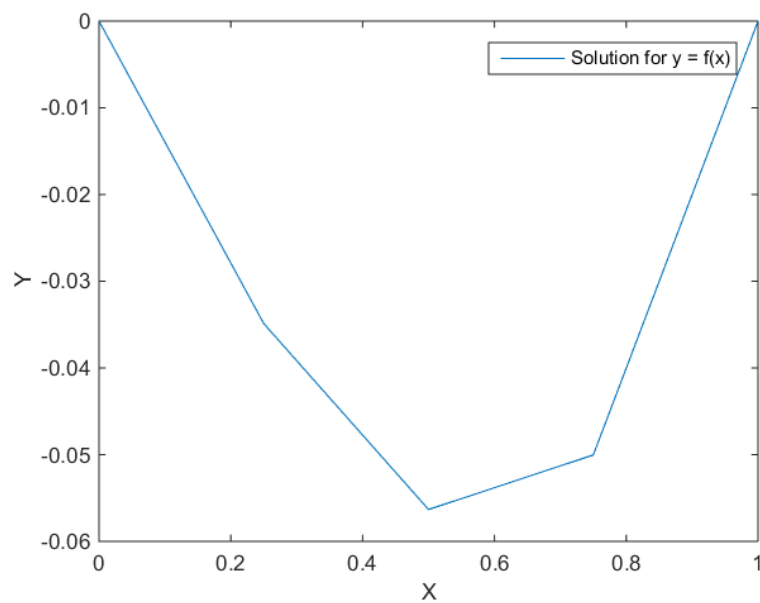


Fig. 1 Graph of the y values calculated

Q.2 Solve this boundary value problem using shooting method and classical runge kutta method.

$$y'' - y = 0$$

$$y(0) = 0$$

$$y(0.5) = 1$$

$$a_0 = 0.3$$

$$a_1 = 0.4$$

$$h = 0.1$$

Solution :-

Trigonal Matrix

$$\begin{bmatrix} -198 & 101 & 0 & 0 \\ 98 & -198 & 102 & 0 \\ 0 & 97 & -198 & 103 \\ 0 & 0 & 96 & -198 \end{bmatrix} Y = \begin{bmatrix} -98.6 \\ 0.8 \\ 1.2 \\ -131.416 \end{bmatrix}$$

$$Y = \begin{bmatrix} 1.0903 \\ 1.1612 \\ 1.2143 \\ 1.2525 \end{bmatrix}$$

$$\text{Plot} = \begin{bmatrix} 0 & 1 \\ 0.1 & 1.0903 \\ 0.2 & 1.1612 \\ 0.3 & 1.2143 \\ 0.4 & 1.2525 \\ 0.5 & 1.2790 \end{bmatrix}$$

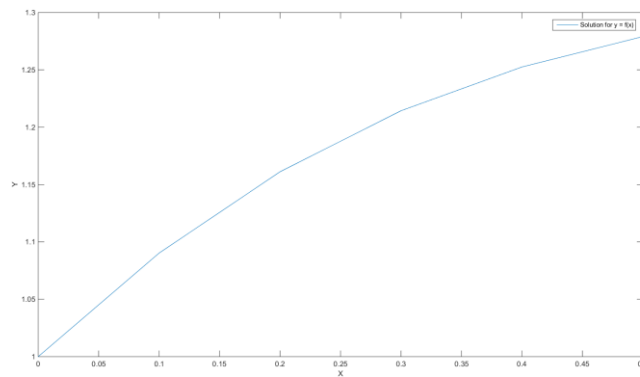


Fig. 2 Graph of the y values calculated