

Lab Report: BVP and the Order of Convergence

Second order finite difference method to solve linear BVPs.

In this lab, we need to solve BVP

$$y'' = -\frac{2}{x}y' + \frac{2}{x^2}y + \frac{\sin(\ln x)}{x^2}, 1 \leq x \leq 2, y(1) = 1, y(2) = 2$$

We use both Crout Factorization method and Jacobi Method to solve Tridiagonal Linear System.

Output:

```
xi      wi      y(xi)
1.0      1.000000    1.000000
1.1      1.092601    1.092629
1.2      1.187043    1.187085
1.3      1.283337    1.283382
1.4      1.381402    1.381446
1.5      1.481120    1.481160
1.6      1.582360    1.582393
1.7      1.684989    1.685014
1.8      1.788882    1.788899
1.9      1.893921    1.893929
2.0      2.000000    2.000000
Using Crout Method r2 error = 3.53726318E-05
1.0      1.000000    1.000000
1.1      1.092382    1.092629
1.2      1.186639    1.187085
1.3      1.282848    1.283382
1.4      1.380836    1.381446
1.5      1.480592    1.481160
1.6      1.581860    1.582393
1.7      1.684609    1.685014
1.8      1.788605    1.788899
1.9      1.893791    1.893929
2.0      2.000000    2.000000
using Jacobi method r2 error = 4.70815547E-04
```