Assignment-4

Problem-1: Try to solve the following set of equations by writing a code for the **Gauss-Seidel iteration method** and **Jacobi iteration method**.

$$\begin{bmatrix} 3 & 7 & 13 \\ 1 & 5 & 3 \\ 12 & 3 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 76 \\ 28 \\ 1 \end{bmatrix}$$

If you don't get correct solutions then check if the matrix is diagonally dominant or not by adding a small part in your code. If not diagonally dominant then make the matrix diagonally dominant and solve again. Print results at each step of iteration till the last coverged result. Comapre the results in both the methods by plotting the number of iteration in X-axis and solution in Y-axis. You have to print your data in two columns. In the first col print number of iterations and in the second col print the solution. You can take any one solution to make this comparision.

The plotting can be done using the gnuplot software. The commands for gnuplot is given below.

Commands for gnuplot.

Open a terminal and type gnuplot. You will see the gnuplot command prompt. Then type the command
plot "outputfile" using col1:col2 with linepoint
In short you can write p "outputfile" u 1:2 w lp
To plot more than one file, e.g. 3 output files then you have to type
p "output1" u 1:2 w lp, "output2" u 1:2 w lp, "output3" u 1:3 w lp

Exact solution for this case is

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \\ 4 \end{bmatrix}$$

Refer to the following figure for Gauss-Seidel(left) and the Jacobi methods(right).