Lab Assignment-4

MTH 308 and & MTH 308B: Numerical Analysis and Scientific Computing-I

January-April 2024, IIT Kanpur

---

1. Write C/Matlab programs for all three iterative methods.

   (a) Gauss-Jacobi iteration

   (b) Gauss-Seidal iteration

   (c) SOR (Successive over relaxation) iteration

   Then, test above 3 methods with the following example(system of equations). Compare your result by printing atleast 10 iterations (this could be your stopping criteria of iterations here) in a table.

$$\begin{aligned} 4x_1 + 3x_2 &= 24, \\ 3x_1 + 4x_2 - x_3 &= 30, \\ -x_2 + 4x_3 &= -24. \end{aligned}$$

   Note that the exact solution is $x = (3, 4, -5)^T$. Take initial approximate solution as $x^0 = (1, 1, 1)^T$. Test SOR method with $w = 1.25$. Your output has the form given below:

Gauss-Jacobi					
Iteration (k)	0	1	2	$\cdots$	10
x_1	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$
x_2	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$
x_3	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$
Gauss-Seidal					
Iteration (k)	0	1	2	$\cdots$	10
x_1	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$
x_2	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$
x_3	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$

SOR (with $w = 1.25$)					
Iteration (k)	0	1	2	$\cdots$	10
x_1	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$
x_2	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$
x_3	1	$\ldots$	$\ldots$	$\ldots$	$\ldots$

Print the solution upto 6-decimal palce.

End.