Exercises

Q1: Consider that, we have the following linear system 4x4

$$\begin{aligned} 2x_1 + x_2 - x_3 + 5x_4 &= 0 \\ x_1 + 2x_3 - x_4 &= 2 \\ x_1 + 4x_2 + x_3 + x_4 &= 1 \\ 3x_1 + x_2 + x_3 - x_4 &= 3 \end{aligned}$$

a. Make sure that, the diagonal control condition is satisfied,
b. Use **Gauss-Sidel** method to find the approximate solution for two iterative step ($x^{(1)}, x^{(2)}$), with considering $x^{(0)} = (\ 0\ ,\ -1\ ,\ \frac{1}{2}\ ,\ 2\ )$.
c. Compute the iterative errors, at each step.
d. What is the stop condition ?

Q2: Consider that, we have the following linear system 3x3

$$\begin{aligned} ax_1 + bx_2 + c\,x_3 &= 2 \\ dx_1 + ex_3 &= 8 \\ +f\,x_2 + g\,x_3 &= 1 \end{aligned}$$

1- Under which condition the above system has a unique solution, in terms of the elements of A ?
2- Use **Gauss** Method, with Forward substitution, to find the solution of this system in terms of the elements of A.

Q3: Consider that, we have the following linear system

$$\begin{aligned} x_1 - x_2 + 2x_3 &= 2 \\ 3x_1 + 3x_3 &= 0 \\ 2x_1 + 5x_2 + x_3 &= 1 \end{aligned}$$

a. Does the system have a unique solution ? why ?
b. Make sure that the diagonal control condition is satisfied.
c. Solve the system by using **LU** method.