Homework 3
CS 323 - Numerical Analysis

1. For each one of the following systems of linear equations:

I)

$$\begin{aligned} 20 &= 8x_1 + 3x_2 \\ 30 &= 12x_2 + 6x_3 \\ 10 &= x_1 + 10x_3 \end{aligned}$$

II)

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

III)

$$\begin{aligned} x_1 + x_2 - x_3 &= -3 \\ 6x_1 + 2x_2 + 2x_3 &= 2 \\ -3x_1 + 4x_2 + x_3 &= 1 \end{aligned}$$

   (a) Use Gaussian Elimination to compute the inverse of A.

   (b) Use the inverse to solve the system of equations.

   (c) Can the LU decomposition be computed without pivoting? If so, provide the LU decomposition of A.

   (d) Use Jacobi's Method to solve the system of equations. Start with a vector of 1's as initial approximation, $\epsilon = 10^{-4}$. It is recommended that you use Excel or write a program in Matlab to help you.

   (e) Use Gauss-Seidel's Method to solve the system of equations. Start with a vector of 1's as initial approximation, $\epsilon = 10^{-4}$. It is recommended that you use Excel or write a program in Matlab to help you.