1. (10 points)
Solve a linear system of equations given by

\[
\begin{align*}
2x_1 + x_2 + x_4 &= 4 \\
2x_1 + 2x_2 + 2x_3 + 4x_4 &= 10 \\
4x_1 + 2x_2 - 3x_3 + 3x_4 &= 6 \\
-2x_1 + x_2 + x_3 + 5x_4 &= 5
\end{align*}
\]

You should first write the above system in matrix form, \( Ax = b \). Then, use Gaussian Elimination to factor the matrix \( A = LU \), where \( L \) is unit lower triangular and \( U \) is upper triangular. Now you have \( Ax = b \Rightarrow (LU)x = b \). Use forward substitution to find \( y \) such that \( Ly = b \), and as the last step use backward substitution to find the final answer \( x \) such that \( Ux = y \).

**Note 1:** Do the above computations using pen/pencil and paper. Show all intermediate steps.

**Note 2:** Verify your answer in MATLAB using \( A \backslash b \).

2. (10 points)
Write a program in Matlab \([x] = \text{lsolve}(A,b)\) to do the above computations. Note that \( A \) can be any matrix and \( b \) can be any right hand side. However, assume that \( A \) is nonsingular and that no “pivoting” is required to solve the linear system. You can use ‘if’, ‘for’, ‘while’ statements and ‘+’, ‘-’, ‘*’ and ‘/’ operations. DO NOT USE any MATLAB functions that directly solve the linear system, such as, \( LU \), \( \text{mldivide} \), \( \backslash \), etc.