Question 1: Let

$$W = \{ \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} : x_1 + x_2 + x_3 + x_4 = 0 \} \subset \mathbb{R}^4$$

.
(a) Show that W is a subspace of $\mathbb{R}^n$.
(b) Find a basis and the dimension of W.

Question 2: Find a LU decomposition for the following matrix:

$$A = \begin{bmatrix} 1 & 2 & 4 \\ 3 & 8 & 14 \\ 2 & 6 & 13 \end{bmatrix}.$$

Use the above dcomposition to find a solution of the system of equations $AX = B$ where

$$B = \begin{bmatrix} 1 \\ 6 \\ 8 \end{bmatrix}.$$

Question 3: Find the nullspace and the range of the following matrix:

$$A = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 2 \\ 2 & 1 & 3 \end{bmatrix}.$$

Question 4: Find eigenvalues and corresponding eigenvectors of the matrix

$$\begin{bmatrix} -2 & -4 & 2 \\ -2 & 1 & 2 \\ 4 & 2 & 5 \end{bmatrix}.$$

Describe the eigenspaces corresponding to each eigenvalue.