

(1) Let

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}.$$

Find the inverse of A , if it exists.

(2) Solve the following system of equations using LU decomposition.

$$\begin{array}{rcl} x & +2y & +4z = 3 \\ 3x & +8y & +14z = 13 \\ 2x & +6y & +13z = 4 \end{array}$$

(3) Solve the following system of equations using LU decomposition.

$$\begin{array}{rcl} 3x & +y & +6z = 0 \\ -6x & & -16z = 4 \\ & 8y & -17z = 17 \end{array}$$

(4) Let W be the set of all linear combinations of columns of A where:

$$A = \begin{bmatrix} 2 & 0 & 6 \\ -1 & 8 & 5 \\ 1 & -2 & 1 \end{bmatrix}, \quad b = \begin{bmatrix} 10 \\ 3 \\ 3 \end{bmatrix}$$

Does b belong to W ?

(5) Consider the vectors

$$u = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}, \quad v = \begin{bmatrix} 2 \\ 1 \\ -3 \end{bmatrix}, \quad \text{and} \quad w = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}.$$

Determine whether these vectors are linearly independent or linearly dependent.