1 Matrix Inverse and Solving Systems of Linear Equations

a) Solve the inverse of matrix A by using the equation-solving method in the form of AX = I. (Hint: Obtain each column of X by solving a separate equation.)

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & 3 \\ 4 & -3 & 8 \end{bmatrix}$$

b) Can the inverse be found for all matrices using this method? Explain.

$MehrshadHassani, SarinaHeshmati$

2 Rank and nullity of matrix

find a basis for row space, column space and null space of matrix A which is given below.

$$A = \begin{bmatrix} -2 & -5 & 8 & 0 & -17 \\ 1 & 3 & -5 & 1 & 5 \\ 3 & 11 & -19 & 7 & 1 \\ 1 & 7 & -13 & 5 & -3 \end{bmatrix}$$

$Authors$

3 Special matrices and matrix operations

Suppose you have the following scenario: You have a company that produces three different products: Product A, Product B, and Product C. These products are sold in two different regions: Region 1 and Region 2. The sales data for the past month is represented by the following matrices:

$$A = \begin{bmatrix} 100 & 150 \\ 200 & 100 \\ 50 & 75 \end{bmatrix}$$

$$B = \begin{bmatrix} 75 & 125 \\ 150 & 50 \\ 100 & 100 \end{bmatrix}$$

$$C = \begin{bmatrix} 125 & 100 \\ 75 & 150 \\ 50 & 200 \end{bmatrix}$$

These matrices represent the number of units sold for each product in each region. Matrix A corresponds to Product A, matrix B corresponds to Product B, and matrix C corresponds to Product C. Now, let's assume that the unit prices for the products are as follows:

- Product A: $10
- Product B: $15
- Product C: $20

Calculate the total revenue generated from the sales in each region using matrix operations.
$Authors$

4 Gaussian elimination and LU factorization

Suppose that A is invertible matrix and has a LU factorization where the diagonal of L or U has only 1 on the diagonal; prove that this LU factorization is unique.
Authors

5 Echelon form

1. Find the coefficients of the following polynomial a, b, c and d so that it applies to the equations below:

$$p(x) = ax^3 + bx^2 + cx + d$$

$$p(1) = 1, p'(1) = 5, p(-1) = 3, p'(-1) = 1$$

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