Inverse of matrix using Gauss Jordan Method

Gauss Jordan Method

Let A be an invertible $n \times n$ matrix. Suppose that a sequence of elementary row-operations reduces A to the identity matrix. Then the same sequence of elementary row-operations when applied to the identity matrix yields A^{-1}.

1. Form the augmented matrix by the identity matrix.i.e,[A | I]
2. Apply row operations to the matrix until the left side is reduced to I. Then, the right side of the augmented matrix is the inverse of the matrix.

In [2]:
```
# Importing NumPy Library
import numpy as np
import sys
```

In [3]:
```
# Reading order of matrix
n = int(input('Enter order of matrix: '))
print("Enter the entries in a single line (separated by space): ")
elements = list(map(int, input().split()))
M=np.matrix(elements).reshape(n, n)
#Check whether the matrix is singular or not
determinant = np.linalg.det(M)
if (determinant != 0):
    print('Non-Singular Matrix')
    Identity_matrix = np.eye(n,n)
    Augument_matrix = np.concatenate((M,Identity_matrix),axis=1)
# Applying Guass Jordan Elimination
    if Augument_matrix[0,0] == 0.0:
        s=1
        while s<n:
            if (Augument_matrix[s,0] != 0.0):
                break
            else:
                s=s+1
        Augument_matrix[[0,s]] = Augument_matrix[[s,0]]

    for i in range(n):

        for j in range(n):
            if i != j:
                ratio = Augument_matrix[j,i]/Augument_matrix[i,i]

                for k in range(2*n):
                    Augument_matrix[j,k] = Augument_matrix[j,k] - ratio * Augument_m

# Row operation to make principal diagonal element to 1
    for i in range(n):
        divisor = Augument_matrix[i,i]
        for j in range(2*n):
            Augument_matrix[i,j] = Augument_matrix[i,j]/divisor
# Displaying Inverse Matrix
    print('\nINVERSE MATRIX IS:')
    for i in range(n):
        for j in range(n, 2*n):
            print(Augument_matrix[i,j], end='\t')
        print()
```

```
else:
    print('Singular Matrix')
```

```
Enter order of matrix: 3
Enter the entries in a single line (separated by space):
7 2 1 0 3 -1 -3 4 -2
Non-Singular Matrix

INVERSE MATRIX IS:
-2.0000000000000075     8.000000000000027       -5.000000000000017
3.0000000000000107      -11.000000000000037     7.000000000000025
9.000000000000032       -34.000000000000114     21.000000000000075
```

Find the inverse of the following matrices using the Gauss-Jordan method.

1. $A = \begin{bmatrix} 3 & 6 & 5 \\ 1 & 3 & 5 \\ 7 & 3 & 0 \end{bmatrix}$

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

3. $C = \begin{bmatrix} 8 & 7 & 1 \\ 4 & 2 & 2 \\ 6 & 1 & 3 \end{bmatrix}$

In [ ]: