Kernel: SageMath 10.1

Experiment No 2

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Aim: To study basics of obtaining solution for system of linear equations

In [1]:

```
M= matrix([[6,7],[1,9]])
show("M=",M)
```

Out[1]:

M= $\begin{pmatrix} 6 & 7 \\ 1 & 9 \end{pmatrix}$

In [2]:

```
q,w,e=M.LU()
show("Upper triangular of M=",q)
show("Lower triangular of M=",w)
show("Permutation Matrix=",e)
diagonal_elements = M.diagonal()
D = diagonal_matrix(diagonal_elements)
show("Diagonal matrix=",D)
print("rank=",M.rank())
```

Out[2]:

Upper triangular of M= $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Lower triangular of M= $\begin{pmatrix} 1 & 0 \\ \frac{1}{6} & 1 \end{pmatrix}$

Permutation Matrix= $\begin{pmatrix} 6 & 7 \\ 0 & \frac{47}{6} \end{pmatrix}$

Diagonal matrix= $\begin{pmatrix} 6 & 0 \\ 0 & 9 \end{pmatrix}$

rank= 2

In [3]:

```
A= matrix([[2,3,4],[1,1,1],[-4,2,0]])
show("A=",A)
```

Out[3]:

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

In [4]:

```
p,l,u=A.LU()
show("Upper triangular of A=",u)
show("Lower triangular of A=",l)
show("Permutation Matrix=",p)
diagonal_elements = M.diagonal()
D = diagonal_matrix(diagonal_elements)
show("Diagonal matrix=",D)
print("rank=",A.rank())
```

Out[4]:

Upper triangular of A= $\begin{pmatrix} -4 & 2 & 0 \\ 0 & 4 & 4 \\ 0 & 0 & -\frac{1}{2} \end{pmatrix}$

Lower triangular of A= $\begin{pmatrix} 1 & 0 & 0 \\ -\frac{1}{2} & 1 & 0 \\ -\frac{1}{4} & \frac{3}{8} & 1 \end{pmatrix}$

Permutation Matrix= $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$

Diagonal matrix= $\begin{pmatrix} 6 & 0 \\ 0 & 9 \end{pmatrix}$

rank= 3

Conclusion: Various operations on matrix is operated successfully

In [0]:

```

```