```
import numpy as np
import sympy as sp
```

```
np.random.seed(29)
A = np.random.randint(0,10,(5,5))
sp.Matrix(A)
```

$$\begin{bmatrix}5 & 3 & 2 & 8 & 0\\9 & 1 & 8 & 5 & 3\\1 & 8 & 1 & 5 & 4\\7 & 0 & 4 & 2 & 6\\7 & 3 & 0 & 8 & 3\end{bmatrix}$$

Get Row Echelon Form of A by performing elementary row operations

```
A[0] = A[0] / A[0, 0]
print("\nAfter scaling the first row to make its leading entry 1:")
sp.Matrix(A)
```

```
After scaling the first row to make its leading entry 1:
```

$$\begin{bmatrix}1 & 0 & 0 & 1 & 0\\9 & 1 & 8 & 5 & 3\\1 & 8 & 1 & 5 & 4\\7 & 0 & 4 & 2 & 6\\7 & 3 & 0 & 8 & 3\end{bmatrix}$$

```
for i in range(1, A.shape[0]):
    A = A.astype(np.float64)
    factor = A[i, 0] / A[0, 0]
    A[i] -= factor * A[0]
print("\nAfter eliminating leading entry in first column in subsequent rows:")
sp.Matrix(A)
```

```
After eliminating leading entry in first column in subsequent rows:
```

$$\begin{bmatrix}1.0 & 0 & 0 & 1.0 & 0\\0 & 1.0 & 8.0 & -4.0 & 3.0\\0 & 8.0 & 1.0 & 4.0 & 4.0\\0 & 0 & 4.0 & -5.0 & 6.0\\0 & 3.0 & 0 & 1.0 & 3.0\end{bmatrix}$$

```
A = A.astype(int)
print("\n Row echelon form of matrix A:")
sp.Matrix(A)
```

Row echelon form of matrix A:

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 8 & -4 & 3 \\ 0 & 8 & 1 & 4 & 4 \\ 0 & 0 & 4 & -5 & 6 \\ 0 & 3 & 0 & 1 & 3 \end{bmatrix}$$