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Practical 5
LU decomposition method

In[1]:=
```
lude[A0_, n_] := Module[{A = A0, i, p},
   U = A0;
   L = IdentityMatrix[n];
   Print[MatrixForm[A0]];
   For[p = 1, p < n - 1, p++,
    For[i = p + 1, i < n, i++,
      m = A[[i, p]] / A[[p, p]];
      L[[i, p]] = m;
      A[[i]] = A[[i]] - m * A[[p]];
      U = A;];];
   Print MatrixForm L , MatrixForm U , "=", MatrixForm A0 ;
```

In[2]:=
```
A = {{1, 1, 1}, {4, 3, -1}, {3, 5, 3}};
lude A, 3
```

$$\begin{vmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{vmatrix}$$

$$\begin{vmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 3 & -2 & 1 \end{vmatrix} \begin{vmatrix} 1 & 1 & 1 \\ 0 & -1 & -5 \\ 0 & 0 & -10 \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{vmatrix}$$

In[4]:=
```
lu, p, c = LUDecomposition 1, 1, 1 , 4, 3, -1 , 3, 5, 3
```

Out[4]=
```
1, 1, 1 , 4, -1, -5 , 3, -2, -10 , 1, 2, 3 , 1
```

In[5]:=
```
l = LowerTriangularize[lu, -1] + IdentityMatrix[3]
u = UpperTriangularize[lu]
MatrixForm[l]
MatrixForm u
```

Out[5]=
```
1, 0, 0 , 4, 1, 0 , 3, -2, 1
```

Out[6]=
```
1, 1, 1 , 0, -1, -5 , 0, 0, -10
```

Out[7]//MatrixForm=

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

Out[8]//MatrixForm=

$$\begin{pmatrix} 1 & 1 & 1 \\ 0 & -1 & -5 \\ 0 & 0 & -10 \end{pmatrix}$$