In [1]:

```python
#Question 1:
#Use LU decomposition, both Crout’s and Doolittle’s method, to solve for xi’s and hence compare your answers. [2+2]

# x1 + x3 + 2x4 = 6
# x2 - 2x3 = -3
# x1 + 2x2 - x3 = -2
# 2x1 + x2 + 3x3 - 2x4 = 0


from My_Lib import *

#calling the matrix in readable form
list_C=[]
with open("matrix1.txt") as matC:
    for k in matC:
        list_C.append(list(map(float, k.split())))



#Printing the solutions of crout
x1 = linear_solver_crout(list_C)
if x1!=None:
    print("x_1 =", x1[0])
    print("x_2 =", x1[1])
    print("x_3 =", x1[2])
    print("x_4 =", x1[3])

#Printing the solutions of do little
x2 = linear_solver_do_little(list_C)
if x2!=None:
    print("x_1 =", x2[0])
    print("x_2 =", x2[1])
    print("x_3 =", x2[2])
    print("x_4 =", x2[3])

if x1 == x2:
    print("\nHence, Solutions for both methods matched! ")
else:
    print("No they didn't match!")
```

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The solutions of the system of linear equations by Crout's method is
x_1 = 1.0
x_2 = -1.0
x_3 = 1.0
x_4 = 2.0
The solutions of the system of linear equations by Dolittle's method is
x_1 = 1.0
x_2 = -1.0
x_3 = 1.0
x_4 = 2.0

Hence, Solutions for both methods matched!
```

In [1]:

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#Question 2:
#Check whether the inverse of the following matrix exists. If yes, find the inverse and
verify.


#  0 2 8 6
#  0 0 1 2
#  0 1 0 1
#  3 7 1 0




from My_Lib import *

list_C=[] #calling the matrix
with open("matrix2.txt") as matC:
    for k in matC:
        list_C.append(list(map(float, k.split())))

Inv_ =LU_inverse(list_C) #calling the inverse function

#printing the inverse in matrix form
if Inv_!=None:
    print('Yes!inverse exist!,The inverse of the matrix is A^(-1)=')

    for i in Inv_:
        print(i)


#verifying the inverse

    print("\nVerifying the inverse")
    print(" Hence The value of AA^(-1)=")
    I= matrix_mul(list_C,Inv_)
# Prints the inverse matrix in readable form
    for i in range(4):
        for j in range(4):
            print(round(I[i][j],2),end =' ') #rounded upto 2 places of decimal
        print('')
```

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Yes!inverse exist!,The inverse of the matrix is A^(-1)=
[-0.25, 1.66667, -1.83333, 0.33333]
[0.08333, -0.66667, 0.83333, 0.0]
[0.16667, -0.33333, -0.33333, 0.0]
[-0.08333, 0.66667, 0.16667, 0.0]

Verifying the inverse
 Hence The value of AA^(-1)=
1.0 0.0 0.0 0.0
0.0 1.0 0.0 0.0
0.0 0.0 1.0 0.0
-0.0 -0.0 -0.0 1.0
```

In [5]:

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#Question 3:
#Use Cholesky decomposition to solve the equation A · x = b where,

#A =10.0 1.0 0.0 2.5
   #1.0 12.0 -0.3 1.1
   #0.0 -0.3 9.5 0.0
   #2.5 1.1 0.0 6.0

#and b =#2.20
        #2.85
        #2.79
        #2.87


from My_Lib import *

#Calling the in a readable form
list_C=[]
with open("matrix3.txt") as matC:
    for k in matC:
        list_C.append(list(map(float, k.split())))


#Printing the solutions due to cholesky's condition
x =Cholesky_Solver(list_C)
print("x_1 = %.2f" %x[0])
print("x_2 = %.2f" %x[1])
print("x_3 = %.2f" %x[2])
print("x_4 = %.2f" %x[3])
```

```
The solutions of the system of linear equations by Cholesky's method is
x_1 = 0.10
x_2 = 0.20
x_3 = 0.30
x_4 = 0.40
```