E94114057 古清賢

1. Use Gaussian elimination and pivoting technique to solve

$$1.19x_1 + 2.11x_2 - 100x_3 + x_4 = 1.12$$

$$14.2x_1 - 0.112x_2 + 12.2x_3 - x_4 = 3.44$$

$$100x_2 - 99.9x_3 + x_4 = 2.15$$

$$15.3x_1 + 0.110x_2 - 13.1x_3 - x_4 = 4.16$$

```
PS C:\Users\古清賢> & D:/anaconda/python.exe c:/Users/古清賢/Documents/GitHub/E94114057_numerical_hw6-1.py
x1 = 0.176776
x2 = 0.012692
x3 = -0.020661
x4 = -1.183264
```

2. Find the inverse of the matrix A where

$$A = \begin{bmatrix} 4 & 1 & -1 & 0 \\ 1 & 3 & -1 & 0 \\ -1 & -1 & 6 & 2 \\ 0 & 0 & 2 & 5 \end{bmatrix}$$

```
PS C:\Users\古清賢> & D:/anaconda/python.exe c:/Users/古清賢/Documents/GitHub/E94114057_numerical_hw6-2.py
Inverse of matrix A:

[[ 0.279693 -0.08046   0.038314 -0.015326]
 [-0.08046   0.37931   0.057471 -0.022989]
 [ 0.038314  0.057471  0.210728 -0.084291]
 [-0.015326 -0.022989 -0.084291  0.233716]]
```

3. Use Crout factorization for a tri-diagonal system to solve the problem

$$\begin{bmatrix} 3 & -1 & 0 & 0 \\ -1 & 3 & -1 & 0 \\ 0 & -1 & 3 & -1 \\ 0 & 0 & -1 & 3 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{Bmatrix} = \begin{Bmatrix} 2 \\ 3 \\ 4 \\ 1 \end{Bmatrix}.$$

```
PS C:\Users\古清賢> & D:/anaconda/python.exe c:/Users/古清賢/Documents/GitHub/E94114057_numerical_hw6-3.py

Solution x:
 [1.436364 2.309091 2.490909 1.163636]
```