Lab 5

1. 提交作業之前，建議可以先點選上方工具列的**Kernel**，再選擇**Restart & Run All**，檢查一下是否程式跑起來都沒有問題，最後記得儲存。
2. 請先填上下方的姓名(name)及學號(stduent_id)再開始作答，例如：

        name = "我的名字"
        student_id= "B06201000"

3. 演算法的實作可以參考lab-5 (https://yuanyuyuan.github.io/itcm/lab-5.html), 有任何問題歡迎找助教詢問。
4. **Deadline: 12/11(Wed.)**

In [1]:

```
name = "馬宗儀"
student_id = "b06201006"
```

(Top)

Exercise 3

Analyse the convergence properties of the Jacobi and Gauss-Seidel methods for the solution of a linear system whose matrix is

$$\left[\begin{matrix}

    \alpha &&0 &&1\\
    0 &&\alpha &&0\\
    1 &&0 &&\alpha
    \end{matrix}\right],
    \quad \quad
    \alpha \in \mathbb{R}.$$

By lecture slide: it hold for $\alpha \neq 0$, Let $D = \begin{bmatrix} \alpha & 0 & 0 \\ 0 & \alpha & 0 \\ 0 & 0 & \alpha \end{bmatrix}, L = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}, U = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix},$

then for Jacobi methods, it converge for $\rho(G) < 1$ where $G = -D^{-1}(L + U)$, then $\rho(G) = \frac{1}{\alpha^2}$ ie. $\alpha > 1$

for Gauss-Seidel metohs, it converge for $\rho(G) < 1$ where $G = -(L + D)^{-1}U$, then $\rho(G) = \frac{1}{\alpha^2}$ ie. $\alpha > 1$

In [ ]: