Numerical Method

National Cheng Kung University Department of Engineering Science

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Lab 2

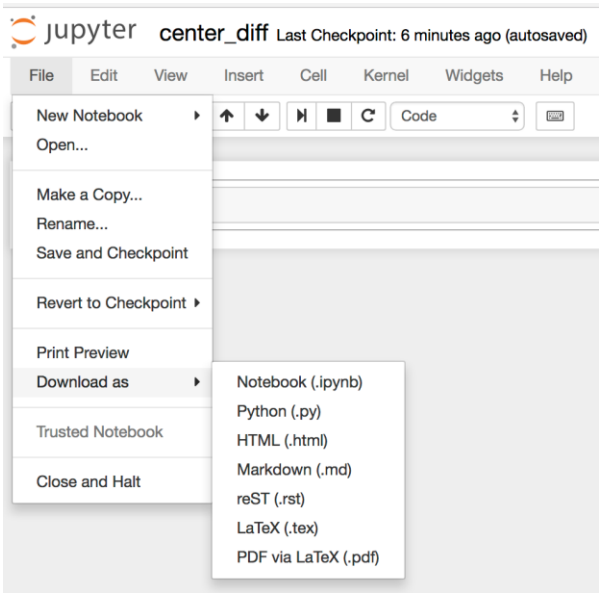
Programming, Due 10:00, Wednesday, March 9th , 2022

注意事項：

1. Lab 的時間為授課結束(Lab 當天 10:00)。
2. Lab 的分數分配：出席 20%，Lab 分數 100%，Bonus 20%。
3. 請儘量於 Lab 時段完成練習，完成後請找助教檢查，經助教檢查後沒問題者請用你的學號與 Lab number 做一個檔案夾 (e.g., N96091350_Lab2), 將你的全部 ipynb 檔放入檔案夾，壓縮後上傳至課程網站 (e.g., N96091350_Lab2.zip)。
4. 上傳後即可離開。
5. 未完成者可於隔日 11:55 pm 前上傳至 Moodle，惟補交的分數將乘以 0.8 計，超過期限後不予補交。
6. Bouns 只需要在每週四的 11:55 pm 上傳即可。

Lab Submission Procedure (請仔細閱讀)

1. You should submit your Jupyter notebook and Python script (`*.py`, in Jupyter, click File, Download as, Python (`*.py`)).



2. Name a folder using your student id and lab number (e.g., n96081494_lab1), put all the python scripts into the folder and zip the folder (e.g., n96081494_lab1.zip).

3. Submit your lab directly through the course website.

1. (100%) Name your Jupyter notebook `gcd.ipynb` and Python script `gcd.py`. Write a Python program that finding a greatest common divisor by using Euclid's algorithm. Euclid's Algorithm states that the greatest common divisor of two integers m and n is n if n divides m evenly. However, if n does not divide m evenly, then the answer is the greatest common divisor of n and the remainder of m divided by n.

The following is an example of finding the greatest common divisor of 1304 and **560** is **8** using the Euclidean algorithm:

Euclidean algorithm		
Step	Equation	Quotient and remainder
1	$1304 = q_1 560 + r_1$	q_1=2 and r_1=**184**
2	$560 = q_2 184 + r_2$	q_2=3 and r_2=**8**
3	$184 = q_3 8 + r_3$	q_3=23 and r_3=0; algorithm ends

The interface of `gcd` function is:

```
Def gcd(m: int,n: int)->int:
""" function of finding a greatest common divisor """
```

Below is the running example

```
In [2]: 1 gcd(1304,560)
        Greatest common divisor: 8

In [3]: 1 gcd(0,5)
        -----------------------------------
        Please enter a number greater than 0
        -----------------------------------
        Enter first positive integer (m):376
        Enter second positive integer (n):5
        Greatest common divisor: 1

In [4]: 1 ?gcd
Signature: gcd(m:int, n:int) -> int
Docstring: function of finding a greatest common divisor
File:      c:\users\user\desktop\數值方法\lab2\<ipython-input-1-10a18fd19ba2>
Type:      function
```

Bonus. (20%): Name your Jupyter notebook `cos_approx` and Python script `cos_approx.py`. Using a `while` loop to implement an approximation of cosine function with polyno -mial:

$$\cos(x) \approx 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} - \cdots + \frac{x^{24}}{24!}$$

Compute the right-hand side for powers up to N = 24. (hint: You can import the function `factorial(N)` in `math` to return N!).

Below is a sample output:

```
cos(2.3) approximation is -0.6662760212798241
```