

HW2: Due Tuesday night 22:00

Note:

- a. 請開啟 word 檔案，檔名用 NTUAS+組別為開頭：例如你們是第一組的話：NTUAS_01_HW2.doc，將圖（如果有的話）以及討論的內容，貼上這個檔案。
- b. 並附上所有的 code files（NTUAS_01_HW2_1.m or NTUAS_01_HW2_1.py, ...）儲存成一個壓縮檔（加上上面的 word file）上傳繳交。

1. Error estimation practice

1.1 Consider the function $f(x) = \frac{e^x - 1}{x}$

- (a) Calculate $f(x)$ for $x = 0.00275$ and round to 5 decimal places.
- (b) Use double precision to store the values $f(x)$. Consider this to be the true value, and calculate the true relative error due to rounding in the value of $f(x)$ that was obtained on part (a)

1.2 The Taylor series expansion of $\cos(x)$ is given by:

$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} - \frac{x^{10}}{10!} + \cdots \quad (1)$$

Use the first three terms in Eq. (1) to calculate the value of $\cos\left(\frac{\pi}{3}\right)$ and round to 6 decimal places (apply rounding at each term). Calculate the truncation error.

2. Bisection method practice

The function $f(x) = 8 - 4.5(x - \sin(x))$; $f(x)$ is zero near $x = 2$, following below rules

- Let the tolerance error be $TOL = 1 \times 10^{-6}$
- Use the bisection method, (initial guess will be 1 and 3)

2.1 Please use “for loop + if” to find its root.

2.2 Please use “while loop + if” to find its root.