

NTUST, CSIE
Calculus I&II (CS161A-001), Fall 2023

Homework 6

Due date: Dec. 18

Total: up to 20 additional pts in the final exam

Problem 6.1. (20pts) We have three ways to define the Euler number e , as follow.

- (a) The number e is the number in the domain of the natural logarithm that

satisfies $\ln e = \int_1^e \frac{1}{t} dt = 1$

(b) $e = \lim_{\delta \rightarrow 0} (1 + \delta)^{1/\delta} = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$

(c) $e = \sum_{n=0}^{\infty} \frac{1}{n!}$

Is it possible to write codes to compute the number e based on the above definitions?

Which definition provides the most efficient approach to approximate the number e ?

In your answer, you should make sure the following:

- (a) You need to submit the codes and the corresponding result.
- (b) Your code for each should be based on an iterative algorithm. That is, your code should consist of a loop procedure and usually it needs the result of $n - 1$ or the result less than or equal to $n - 1$ to obtain the result of n .
- (c) You may include the part to tell which code provides the most efficient approximation, in terms of the number of iterations or time.
- (d) In each of the iteration, you may need to specify the stopping criteria such as when you believe the precision is good enough and you should terminate the loop.