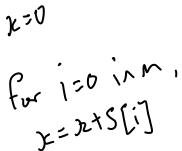
## NANYANG TECHNOLOGICAL UNIVERSITY School of Electrical & Electronic Engineering



## **IE2108 Data Structures and Algorithms**

**Tutorial No. 2 (Sem 1, AY2022-2023)** 

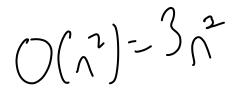
- 1. Write an algorithm that returns the sum of first *m* elements of an array *S*.
- 2. Write an algorithm that outputs the smallest and largest values in the array S which has *m* unique elements.
- 3. Given an array  $s[1], s[2], \dots, s[n]$  such that n > 1 and  $s[i] \le s[i+1]$  for all i. Write an algorithm that insert an input value x into the array so that  $s[i] \le s[i+1]$  for all i.
- 4. Order the following functions according to their order of growth (from the lowest to the highest).

$$n!$$
,  $5 \lg(n+100)^{10}$ ,  $2^{2n}$ ,  $n^4 + 3n^3 + 1$ ,  $n \lg n$ ,  $3^n$ 

5. Prove the following assertion:

If 
$$f(n) = O(g(n))$$
, then  $g(n) = \Omega(f(n))$ .

- 6. Prove that  $\lg(n^k + c) = \Theta(\lg n)$  for every fixed k > 0 and c > 0. Note that  $\lg x =$  $\log_2 x$ .
- 7 (if) If  $f(n) = 2n^2 + 1$ , prove that  $f(n) = O(n^2)$ .
  - (ii) If  $f(n) = 2^{n+2}$ , prove that  $f(n) = O(2^n)$ .



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