NANYANG TECHNOLOGICAL UNIVERSITY
School of Electrical & Electronic Engineering

EE2008/IM1001 Data Structures and Algorithms

Tutorial No. 2 (Sem 2, AY2021-2022)

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 $s[1], s[2], \cdots, s[n]$ such that $n > 1$ and $s[i] \leq s[i+1]$ for all i. Write an algorithm that insert an input value x into the array so that $s[i] \leq s[i+1]$ 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 $c > 0$.

7 (i)   If $f(n) = 2n^2 + 1$, prove that $f(n) = O(n^2)$.
   (ii) If $f(n) = 2^{n+2}$, prove that $f(n) = O(2^n)$.