Tutorial 2

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. Write an algorithm that reverses the array $s[1], \ldots, s[n]$.

4. Given an array $s[1], \ldots, s[n]$ 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.

5. 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

6. Prove the following assertion:

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

7. Prove that $\lg(n^k + c) = \Theta(\lg n)$ for every fixed $k > 0$ and $c > 0$

8 (i) If $f(n) = 2n^2 + 1$, prove that $f(n) = O(n^2)$
(ii) If $f(n) = 2^{n+2}$, prove that $f(n) = O(2^n)$
(iii) If $f(n) = 3 \lg n + 2$, prove that $f(n) = O(\lg n)$