

CSC 225 SUMMER 2014
ALGORITHMS AND DATA STRUCTURES I
ASSIGNMENT 1
UNIVERSITY OF VICTORIA

1. Order the following functions by order of growth starting with the slowest.
 $n^{0.1}$, 2^{2^n} , $5n$, $(\log n)^5$, n^5 , 5 , 5^n , $n!$, $4^{\log n}$, $2n \log \log n$.
2. Consider the following sum: $S(n) = \sum_{i=1}^n \log i$. Give a simple function $f(n)$ so that the sum $S(n)$ is $\Theta(f(n))$. Explain why.
3. (a) Show that $f(n) = 4 \log n + \log \log n$ is $\Theta(\log n)$. Give two proofs using the two definitions of Θ we learnt in the class.
(b) Show that $f(n) = 12n^2 + 6n$ is $o(n^3)$ and $\omega(n)$. Give two proofs for each using the two definitions of o and ω from the class.
4. Prove by induction:

$$\sum_{i=1}^n (2i - 1) = n^2 \text{ for all } n \geq 1.$$

5. Recall the recursive algorithm for finding the maximum in an array discussed in the lecture slides. Prove, by induction, that this algorithm computes the correct answer for an input array of any size.