CSC 225 SPRING 2018
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. Solve Problem 1.4.6 on Page 208 in the textbook. It asks you to give the order of growth (as a function of N) of the running times for three code fragments.

4. Prove by induction:
   $$\sum_{1=1}^{n} (2i - 1) = n^2 \text{ for all } n \geq 1.$$

5. An Array A contains $n - 1$ unique integers in the range $[0, n - 1]$. That is, there is one number in this range that is not in A. Describe in pseudo-code an O(n)-time algorithm for finding that number. You are only allowed to use O(log n) bits of additional space besides the array A itself.