CSC210: Data Structures and Algorithms
Assignment 4

due: 9:30, on 18.10.2018
Please explain your answers in detail.

1. Show how to implement stack with a priority queue. (Explain and write pseudocode for stack operations using procedures for a priority queue.)

2. Use the substitution method to prove that the recurrence $T(n) = T(n-1) + \Theta(n)$ has the solution $T(n) = \Theta(n^2)$.

3. What is the running time of QUICKSORT when all elements of array A have the same value?

4. Describe an algorithm that, given n integers in the range 0 to k, preprocesses its input and then answers any query about how many of the n integers fall into a range $[a..b]$ in $O(1)$ time. Your algorithm should use $\Theta(n+k)$ preprocessing time. Write pseudocode for preprocessing stage and query stage.

5. How to sort n integers in the range 0 to $n^3 - 1$ in $O(n)$ time?

6. Explain why the worst case running time for BUCKET SORT is $\Theta(n^2)$. What simple change to the algorithm preserves its linear average case running time and makes its worst case running time $O(nlgn)$.