CMPT 307-08-2 Assignment 2

(From lecture on May 13, 2008)

Deadline: May 20, 5:30pm

Problem 2.1. Write a pseudo code for the procedure $\textsc{Merge}(A, p, q, r)$ used in Merge-sort algorithm for merging two sorted arrays $A[p \dots q]$ and $A[q+1 \dots r]$ into one *without using sentinels* (see Section 2.3.1 of the textbook for details).

Problem 2.2. Show that the solution of

$$T(n) = 2T(\lfloor n/2 \rfloor + 25) + n$$

is in $O(n \log n)$ and in $\Omega(n \log n)$.

Problem 2.3. Use a recursion tree to determine a good asymptotic upper bound on the recurrence

$$T(n) = 3T(\lfloor n/2 \rfloor) + n\,.$$

Problem 2.4. Use the master method to give tight asymptotic bounds for the following recurrences:

(a) $T(n) = 4T(n/2) + n$,

(b) $T(n) = 4T(n/2) + n^2$,

(c) $T(n) = 4T(n/2) + n^3$.

Problem 2.5. What are the minimum and maximum numbers of elements in a heap of height h? Prove that an n-element heap has height $\lfloor \log_2 n \rfloor$.