

# Program Construction 2 (PK2)

## Assignment 3 of Spring 2007

Solutions should be written in English in a txt, pdf, or html file (no other format is allowed). In a txt or html file, write `Omega` for  $\Omega$ , `O` for  $O$ , `Theta` for  $\Theta$ , `n^a` for  $n^a$ , and `sqrt(n)` for  $\sqrt{n}$ .

### A Master Theorem

Solve the following recurrences with help of *Master Theorem* (MT). Explain which case is used, why it applies, and how you used it. If MT does not apply: specify why MT does not work, and use another method for solving recurrences.

1.  $T(n) = 4T(\frac{n}{2}) + n^2$
2.  $T(n) = T(n - 1) + n$
3.  $T(n) = 8T(\frac{n}{3}) + 2^n$
4.  $T(n) = 4T(\frac{n}{2}) + \lg n$
5.  $T(n) = 3T(\frac{n}{4}) + n \lg n$

### B Analysis of list functions

Every recursive algorithm consists of next steps: divide, conquer, and combine. Give efficient recursive SML functions, recurrences for the running time of the functions, and  $\Theta$  for the recurrences for next primitive SML list functions:

1. last N
2. rev N
3. M @ N

where M and N are lists with  $m$  and  $n$  elements respectively. Explain which case of *Master Theorem* (MT) is used, why it applies, and how you used it. If MT does not apply: specify why MT does not work, and use another method for solving recurrences.