# Homework 11

You have to submit your solutions as announced in the lecture.

Unless mentioned otherwise, all problems are due 2017-05-11, 11:00.

There will be no deadline extensions unless mentioned otherwise in the lecture.

#### Problem 11.1 Tail Recursion

Points: 6

Homework 11

given: 2017-05-02

Give a tail-recursive definition of the function  $map[A](x:List[A], f:A \to B):List[B]$  of lists. The following partial solution may help:

```
\begin{aligned} &\mathbf{fun} \ map[A](x:List[A], \ f:A \to B) = \\ & \ mapAux(x,f, \quad ) \end{aligned} &\mathbf{fun} \ mapAux[A](x:List[A], \ f:A \to B, \ result:List[B]) = \end{aligned}
```

# Problem 11.2 Backtracking

Points: 8

Write a program that finds a solution to the n-queens problems (on an  $n \times n$  board) using the general backtracking algorithm.

#### Problem 11.3 Divide and Conquer

Points: 8

Implement Karatsuba's divide-and-conquer algorithm for the multiplication of two polynomials of degree  $2^n - 1$  as described in the notes.

### Problem 11.4 Master Theorem

Points: 6

Apply the master theorem to derive the  $\Theta$ -class of the time complexity of

- 1. mergesort
- 2. binary search
- 3. Karatsuba multiplication of polynomials

Show your work.