

## Homework Exam 1 2019

**Deadline:** 22 November 2019, 12:45

This homework exam has 1 question for a total of 9 points. You can earn an additional point by a careful preparation of your hand-in: using a good layout, good spelling, good figures, no sloppy notation, no statements like “The algorithm runs in  $n \log n$ .” (forgetting the  $O(\cdot)$  and forgetting to say that it concerns time), etc. Use lemmas, theorems, and figures where appropriate.

**Question 1** (9 points)

Let  $S$  be a set of  $n$  disjoint line segments, and let  $\mathcal{D} = [x_{\min}, x_{\max}] \times [y_{\min}, y_{\max}]$  be an axis parallel rectangle. You can assume that no two endpoints have the same  $x$ -coordinate or the same  $y$ -coordinate. Develop an  $O(n \log n)$  time algorithm to find a longest vertical line segment  $\overline{ab} \subseteq \mathcal{D}$  whose interior intersects the interior of at most one segment in  $S$ . Prove that your algorithm is correct and achieves the desired running time.