

**Problem Set 1 for “Automata Theory”****Deadline: April 22, 13:15**

In all problems the alphabet is  $A = \{a, b\}$ . Recall that  $|w|_a$  denotes the number of letter  $a$  in word  $w$ .

H 1-1 Find finite automata recognizing the following languages over the alphabet  $A$ :

- |                    |               |
|--------------------|---------------|
| (a) $\emptyset$    | (f) $A^*$     |
| (b) $\{\epsilon\}$ | (g) $(AA)^*$  |
| (c) $\{a\}$        | (h) $A^*bA^*$ |
| (d) $\{ba\}$       | (i) $A^*a$    |
| (e) $b^*$          | (j) $A^+$     |

H 1-2 Prove that the automata in Examples 1.2 and 1.3 from the lecture recognize the respective languages.

H 1-3 Construct an automaton recognizing the language:

$$\{w \in A^* : |w|_a \text{ even, but } |w|_b = 2\}.$$

---

The solution to the following problem problems should be prepared but not handed in.

S 1-1 Find a finite automaton recognizing  $L = A^* \setminus A^*abbA^*$ .

S 1-2 Determine the language recognized by the automaton in Example 1.4 from the lecture.

S 1-3 Find a finite automaton recognizing the language consisting of all words, where every subword  $ba$  is immediately preceded by a letter  $a$ .