

Recommended problems 4 — CS3512 — Fall '11

You should be able to do the rest of the textbook exercises for Section 1.3. As usual, look them over and do as many as you need. (You can start by checking yourself against the problems answered in the back of the book. If you have questions about other problems from the book, please send email or otherwise ask.)

You may notice that the textbook's example solutions for problem 18 (Section 1.3) are not up to the standards of this class. Given what we have done so far, you can provide good proofs for 18a and 18b. Good proofs for 18c and 18d are not so easy — don't worry about this now. Try to understand intuitively why those claims are true.

As usual, there are also questions raised in lecture notes (and left for you to answer). Worth considering.

Additional problems

- 1 Find a language L over alphabet $\{a\}$ s.t. $|L| = 3$ and $|L^2| + 3 = |L|^2$.
- 2 Let L be the set of all strings of length k over $\{a, b, c, d\}$. Let M be the set of all strings of length k over $\{a, b, c, e\}$.

$$|L - M| =$$

- 3 Simplify the following expressions.

$$\{0, 1\}^* \{00\}^* =$$

$$(\{00\}^* \{1\}^* \{0\}^*) \cap (\{11\}^* \{0\}^* \{1\}^*) =$$

- 4 For each natural number n , let F_n denote the set consisting of all the languages over the alphabet $\{0, 1\}$ whose strings have length at most n .

Claim: For each $n \in \mathcal{N}$, F_n is a finite set. One way to see this is to give a mathematical expression for $|F_n|$ in terms of n . Please do that.

(Hints: How many binary strings have length k ? How many binary strings have length at most n ? It is fine to use \sum in your answer to express the sum of, say, $n + 1$ terms.)