

Homework 1 – Due Thursday, September 3, 2008 before the lecture

Please refer to the general information handout for the full homework policy and options.

Page limit You can submit **at most** 1 page per problem, even if the problem has multiple parts. If you submit a longer solution for some problem, only the first page will be graded. This homework contains 3 mandatory and 1 optional problem, worth 10 points each. *Your solution to each problem should be handed in on a separate sheet of paper.*

Reminder Collaboration is permitted, but you must write the solutions *by yourself without assistance*, and be ready to explain them orally to the instructor if asked. You must also identify your collaborators. Getting solutions from outside sources such as the Web or students not enrolled in the class is strictly forbidden.

Exercises Please practice on exercises and solved problems in Chapters 1. The material they cover may appear on exams.

Problems *Your solution to each problem should be handed in on a separate sheet of paper. Different problems will be graded by different people.*

1. (**DFA and NFA constructions**) In all parts the alphabet is $\{0, 1\}$. Give state diagrams of DFAs recognizing the the following languages. If you want you may use JFLAP to construct your machines.

- (a) $L_1 = \{w \mid w \text{ represents a binary number that has remainder 0 or 3 when divided by 5}\}$. Leading 0s should be ignored. The empty string can be accepted or rejected – it is up to you.
- (b) $L_2 = \{w \mid \text{every odd position of } w \text{ is 1 and it contains at least two 0s}\}$.

Give state diagrams of NFAs recognizing the the following languages.

- (c) $L_3 = \{w \mid w \text{ contains at least two occurrences of } 10\}$.
- (d) $L_4 = (L_3)^*$. (*Hint: Try to give a simple description of L_4 in English. Is ϵ in L_4 ?*)

2. (**Complement**) Book, 1.14.

3. (**Times3 and closure under NOEXTEND**) (a) Book, 1.33; (b) Book, 1.40b.

4* (**Optional, no collaboration is allowed**) Book, 1.57.