

Exercises below are your homework; they will be discussed during exercise classes. Problems marked with a (\*) are more challenging.

### WEEK 3

1. Consider the following transition table ( $\delta$  function) of a DFA.  $A$  is a start state and  $D$  is the only accepting state.

	0	1
$A$	$B$	$A$
$B$	$A$	$C$
$C$	$D$	$B$
$D$	$D$	$A$
$E$	$D$	$F$
$F$	$G$	$E$
$G$	$F$	$G$
$H$	$G$	$D$

- a. Draw the table of distinguishabilities for this automaton by minimization algorithm.
  - b. Construct the minimum-state equivalent DFA.
2. (\*) Prove Lemma 1 from the lecture on Chomsky hierarchy. That is, show  
**Lemma 1.** *Let  $G = (N, T, P, S)$  be a context free grammar. Let  $B \in N$  and  $w \in (N \cup T)^+$ . Then there is a derivation tree for  $G$  with root  $B$  and border word  $w$  if and only if  $B \xrightarrow{*}_G w$ .*
  3. Read and understand Theorem 2.34 (Pumping lemma for context-free languages) from Michael Sipser “Introduction to theory of Computation” (3rd edition).
  4. Show that the language  $L = \{a^n b^n c^n : n \geq 1\}$  is not context free.