

CS154 Assignment 3

January 31, 2001

The homework should be done without collaboration!

Please submit every problem on a separate sheet.

Assignment due: 02/07/2001 at 3:15pm.

1. Sipser 2.21 (on ambiguity)
2. Show that the complement of a context-free language need not be context-free.
3. Convert to Chomsky normal form:

$$\begin{aligned} S &\rightarrow AabC \\ A &\rightarrow Cc \\ C &\rightarrow A \mid ba \mid \epsilon \end{aligned}$$

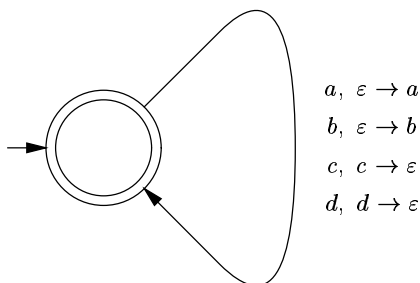
Here $V = \{S, A, C\}$, $\Sigma = \{a, b, c\}$ and S is the start variable.

4. Give a PDA for the following CFG (recognizing the same language):

$$\begin{aligned} S &\rightarrow AabC \\ A &\rightarrow cC \\ C &\rightarrow S \mid ba \mid \epsilon \end{aligned}$$

Here $V = \{S, A, C\}$, $\Sigma = \{a, b, c\}$ and S is the start variable.

5. Convert the following PDA to a CFG (generating the same language):



6. Give a PDA recognizing the language $\{0^i 1^{i+j} 2^j \mid i, j \in \mathbb{N}\}$.

Extra credit problem (optional): Show that every context-free language over a 1-letter alphabet is regular.

Hint: Use the pumping lemma for context-free languages to show that every such language can be written as a union of finitely many regular languages.