

CS310 : Automata Theory 2019

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Tutorial sheet 6 Pumping lemma for CFG, and applications of CFG

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1. Prove or disprove that ϵ rule elimination may introduce useless symbols
2. Prove the following is not a CFL using pumping lemma
 - $\{1^n | n \geq 0\}$
 - $\{1^{n^2} 0^n | n \geq 0\}$
3. Write the *CYK* parsing algorithm if the RHS of the rules may have more than two nonterminals
4. Recall that in the case of regular languages, we have a generalized version of the pumping lemma. In the case of CFLs, do we have a similar generalization? If yes, write down the generalized version of the pumping lemma.
5. Let L be any language (not necessarily regular) over a unary alphabet, i.e., $L \subseteq a^*$. Show that L^* is regular.
6. Prove or disprove the following: any context-free language L that does not contain ϵ , there is a grammar $G = (V, T, P, S)$ such that G generates L and every production rule in G has form $A \rightarrow BCD$ or $A \rightarrow a$, where $A, B, C, D \in V$ and $a \in T$.