

Course: CSC707, Automata, Computability and Computational Theory

Homework 6: Context-free languages, context-free grammars, PDA, Pumping lemma.

Submission: Use Wolfware

File Format: LaTeX and PDF, and any images you have

Due Date: 2:00 A.M. (EST), Tuesday, April 13, 2010

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1. Prove non-context-free using Pumping lemma:
 - (a) $L = \{0^i 1^j 2^i 3^j \mid i, j \geq 1\}$
 - (b) $L = \{a^i b^j c^k \mid 0 \leq i < j < k\}$
 - (c) $L = \{a^i b^j \mid j = i^2\}$
 - (d) \bar{L} , where $L = \{0^k \mid k \text{ is a perfect square}\}$
 2. Design a PDA and provide a context-free grammar (in any form) to accept the following language:
 - (a) $L = \{a^n b^{n+m} c^m \mid n \geq 0, m \geq 1\}$
 - (b) The set of all strings over $\{a, b\}$ with exactly twice as many a 's as b 's.
 3. Give a context-free grammar in Chomsky Normal Form that generates the following language:
 - (a) The set of all strings over $\{a, b\}$ with exactly twice as many a 's as b 's.
 - (b) $L = \{w \in (a + b + c)^* \mid n_a(w) + n_b(w) \neq n_c(w)\}$, where $n_a(w)$ is the number of a 's in w .
 - (c) $L = \{a^i b^j c^k \mid i \neq j \text{ or } j \neq k\}$