

CS 311 Homework 4

October 25, 2013

1. Consider the language defined by $0^*1^*0^+$
 - (a) Convert this language into an NFA with three states
 - (b) Convert the NFA you made into a DFA, By showing all the states, i.e. don't optimize it.
 - (c) Remove dead or unreachable states from the previous DFA.
2. (from 1.29 and 1.46 of Sipser) Prove the following languages are not regular using the pumping lemma.
 - (a) $\{w|w \in \{0,1\}^*$ is not a palindrome} (hint: you can use closure properties under regular operations)
 - (b) $\{wtw|w, t \in \{0,1\}^+\}$
 - (c) $\{www|w \in \{a,b\}^*\}$
3. (from 1.53 of Sipser) Let $\Sigma = \{0, 1, +, =\}$ then show the language
$$\{x = y + z|x, y, z \text{ are binary integers, and } x \text{ is the sum of } y \text{ and } z\}$$
is not regular.
4. (from 2.4 of Sipser) Give context-free grammars that generate the following languages. In all parts, the alphabet Σ is $\{0, 1\}$.
 - (a) $\{w|w \text{ starts and ends with the same symbol}\}$
 - (b) $\{w| \text{ the length of } w \text{ is odd}\}$
 - (c) $\{w|w \text{ is a palindrome}\}$