

01204213: Homework 5

Due: 23pm, 9 Aug 2021.

1. (Sipser 2.42) Use the pumping lemma to show that the following languages are not context free.
 - (a) $\{0^n 1^n 0^n 1^n \mid n \geq 0\}$
 - (b) $\{t_1 \# t_2 \# \cdots \# t_k \mid k \geq 2, \text{ each } t_i \in \{a, b\}^*, \text{ and } t_i = t_j \text{ for some } i \neq j\}$
2. (Sipser 2.43) Let B be the language of all palindromes over $\{1, 0\}$ containing equal numbers of 0s and 1s. Show that B is not context free.
3. (Sipser 2.44) Let $\Sigma = \{1, 2, 3, 4\}$ and $C = \{w \in \Sigma^* \mid \text{in } w, \text{ the number of 1s equals the number of 2s, and the number of 3s equals the number of 4s}\}$. Show that C is not context free.