01204213: Homework 6

Due: 23pm, 9 Aug 2021.

1. (Siper 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) $\{t_1 \# t_2 \# \cdots \# t_k \mid k \geq 2,\ \text{each } t_i \in \{\mathtt{a}, \mathtt{b}\}^*,\ \text{and } t_i = t_j \text{ for some } i \neq j\}$

2. (Sipser 2.43) Let B be the language of all palindromes over $\{\mathtt{1}, \mathtt{0}\}$ containing equal numbers of $\mathtt{0}$s and $\mathtt{1}$s. Show that B is not context free.

3. (Sipser 2.44) Let $\Sigma = \{\mathtt{1}, \mathtt{2}, \mathtt{3}, \mathtt{4}\}$ and $C = \{w \in \Sigma^* \mid$ in w, the number of $\mathtt{1}$s equals the number of $\mathtt{2}$s, and the number of of $\mathtt{3}$s equals the number of $\mathtt{4}$s $\}$. Show that C is not context free.