

Seminar 4

Exercise 1. Using the pumping lemma for regular languages, prove the following languages are not regular.

1. $L \subseteq \{0, 1, 2\}^* = \{0^n 1^n 2^n \mid n \geq 0\}$
2. $L \subseteq \{a, b\}^* = \{www\}$
3. $\{a^i b^j \mid i > j\}$
4. The language of well-formed parentheses.

Exercise 2. Are the following true?

1. Nonregular languages are closed under complement.
2. Nonregular languages are closed under union.

Exercise 3. Consider the following language:

$$L = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and if } i = 1, \text{ then } j = k\}.$$

Show that L satisfies the pumping lemma but it is not regular.