SS 2019 1.05.2019

Exercises to the lecture
Algorithmic Automata Theory
Sheet 1

Dr. Prakash Saivasan Delivery until 07.05.2019 at 15:00

Exercise 1.1 (Ehrenfeucht-Fraïssé Games)
Let $n \in \mathbb{N}$ be arbitrary. Which is the maximal number of rounds $k \in \mathbb{N}$ such that the duplicator has a winning strategy for $G_k\left((ab)^{2n+1}, (ba)^{2n+1}\right)$?
Hint: First see what happens for $n = 1$ and $n = 2$.

Exercise 1.2 (Star-Free Languages)
Prove or disprove whether the following languages over $\Sigma = \{a, b\}$ are star-free:

1. $(ab \cup ba)^*$
2. $(a \cup bab)^*$
3. $\mathcal{L}_{odd} = \{w \in \Sigma^* \mid w \text{ has odd length}\}$

Exercise 1.3 (Star-Free $\Rightarrow$ FO[<]-definable)

1. Show that FO[<]-definable languages are closed under concatenation.
2. Prove using structural induction that every star-free language is FO[<]-definable.

Delivery until 07.05.2019 at 15:00 into the box next to 343 or in the class