

Homework 7 — Due: Tuesday, October 18, 2022

Please submit your work on Brightspace, in PDF format only.

1. Show that $L = \{ww^R \mid w \in \{0,1\}^+\}$ is not a regular language.
(Recall that w^R is the reverse of the string w and $\{0,1\}^+ = \{0,1\}^* - \{\epsilon\}$.)
2. For each of the following languages, determine whether it is regular. Present a proof for your answer:
 - (a) The set of binary strings having an equal number of 0's and 1's.
 - (b) The set of binary strings having an equal number of 01's and 10's.
3. (a) Prove the following stronger form of the Pumping Lemma: If L is a language accepted by a DFA with s states, then for any string $w \in L$ with $|w| \geq s$ and any way of writing $w = xyz$ with $|y| \geq s$, there exist u , v , and w such that $y = uvw$, $v \neq \epsilon$, and $xuv^i wz \in L$ for all $i \geq 0$.
(The reason it is stronger is that it gives us some control over the portion of the string w that is to be “pumped”.)
 - (b) Show that $L = \{ww^R x \mid w \in \{0,1\}^+, x \in \{0,1\}^*\}$ is not a regular language.
(You might find the stronger form of the Pumping Lemma to be useful.)