Assignment 2 – Pumping Lemma

Due Tue Feb 3, 2026

1. Prove that the following language is not regular. /8

$L_1 = \{ w \in \{\#, 0, 1\}^* \mid w = x \# y$ where x and y are binary encodings of integers n_x and n_y, respectively, with at least one leading 0, and $n_x < n_y \}$

Example: $011 \# 001101 \in L_1$.

$n_x = 3$ $n_y = 9$

Hint: Closure theorems can be used effectively here.

2. Prove that the class RL of regular languages is closed under Reverse ... i.e show that if L is regular, so is L^R where

$$L^R = \{ w^R \mid w \in L \}$$

/8

3. Prove using the Pumping Lemma that

$L_3 = \{ a^i b^j c^k \mid i \geq j + k \}$ is not regular.

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4. give a CFG for the language

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$L_3 = \{ a^i b^j c^k \mid i \geq j+k \}$