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CSC:341 Spring 2024

Lab #4A

Due: February 17, 2024

#1 Pumps

1. Revisit the first example proof of irregularity in the book (example 1.73, pp. 80, that shows $B = \{0^n 1^n \mid n \geq 0\}$ is irregular). For each of the variables introduced in the proof, say whether that variable is *held arbitrary* or chosen to be a particular value.

   - p
   - s
   - x, y, and z
   - i

2. In the proof, Sipser chooses the string $s = 0^p 1^p$ to analyze. We have three options to consider for y when splitting s into xyz. What are these three options for y? Recall that y must be nonempty, so $y = \epsilon$ is not a case.

   It may be helpful to consider the visual aid below.

   $$s = \underbrace{0 \cdots 0}_{p} \underbrace{1 \cdots 1}_{p}$$

3. Use condition (3) of the pumping lemma to make this proof shorter by eliminating two of the cases above.

#2 Nope, Not Regular

Consider the language $A = \{ www \mid w \in \Sigma^* \}$ with $\Sigma = \{ 0, 1 \}$. Prove that A is irregular with the pumping lemma.

Hint: Consider $s = www$ for $w = 0^p 1^p$.