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Question 1 47

Let $\Sigma = \{1, \#\}$

$Y = \{w | w = x_1 \# x_2 \# \dots \# x_k \ k \geq 0, \text{each } x_i \in 1^*, x_i \neq x_j, i \neq j)\}$

Prove Y irregular

Pumping Lemma

$$|s| \geq p \quad s \text{ can be written as } s = xyz$$

1. $|xy| \leq p$
2. $|y| > 0$
3. $xy^i z \in \text{ for all } i \geq 0$

If Y were regular then it's complement is regular

Let $X = \{1^n \# 1^n \text{ for } n \geq 0$

let $w = xyz \quad |w| \geq k$

$|xy| \leq k \quad |y| \geq 1$

$x = 1^r, \ y = 1^s, \ z = 1^{k-r-s} \# 1^k \quad \text{as long as } r+s \leq k$

By 3rd rule $i = 0 \quad xy^0 z = 1^{k-r} \# 1^k \quad$ this doesn't

equal $1^n \# 1^n$ since r must be greater than 1.

Since X is not regular, Y is not regular