

**Theory of Computation, CSCI 438 spring 2022**

**More examples proving that languages are not regular, Feb. 7**

1.53 Let  $\Sigma = \{0, 1, +, =\}$  and

$ADD = \{x=y+z \mid x, y, z \text{ are binary integers, and } x \text{ is the sum of } y \text{ and } z\}$ .

Show that ADD is not regular.

1.47 Let  $\Sigma = \{1, \#\}$  and let

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

Prove that Y is not regular.

Determine whether or not the following language is regular. If it is regular, prove it giving a DFA or an NFA for it; if it is not regular, prove it is not using the pumping lemma.

$$L = \{wtw \mid w, t \in \{0,1\}^+\}$$

Problem 1.54 (page 91)

Consider the language  $F = \{a^i b^j c^k \mid i, j, k \geq 0 \text{ and if } i=1 \text{ then } j=k\}$ .

- a. Show that  $F$  is not regular.
  
  
  
  
  
  
  
  
  
- b. Show that  $F$  acts like a regular language in the pumping lemma. In other words, give a pumping length  $p$  and demonstrate that  $F$  satisfies the three conditions of the pumping lemma for this value of  $p$ .
  
  
  
  
  
  
  
  
  
- c. Explain why parts a and b do not contradict the pumping lemma.