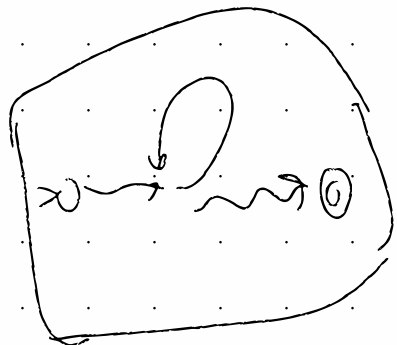


# Pumping lemma

infinite regular language,  
any sufficiently long string  
can be pumped

Machine

①



state trajectory

R.E. started w/ finite stuff  
 $\Sigma$ , operat. union concat.

$A^*$  ← now mean  $\infty$

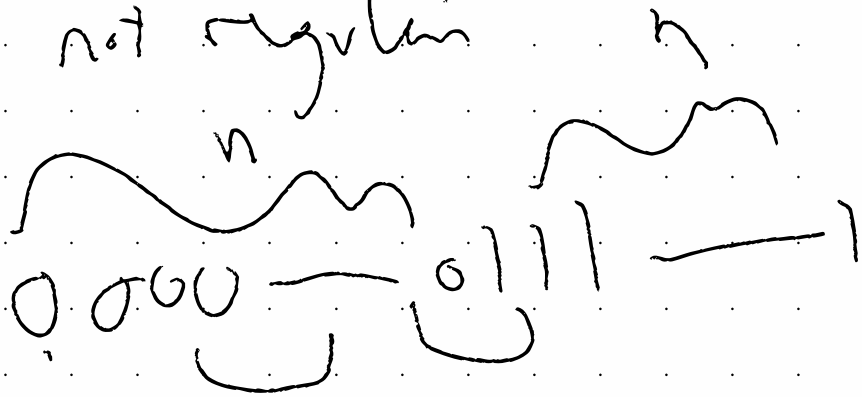
②

③

Finite state machine  
can't work

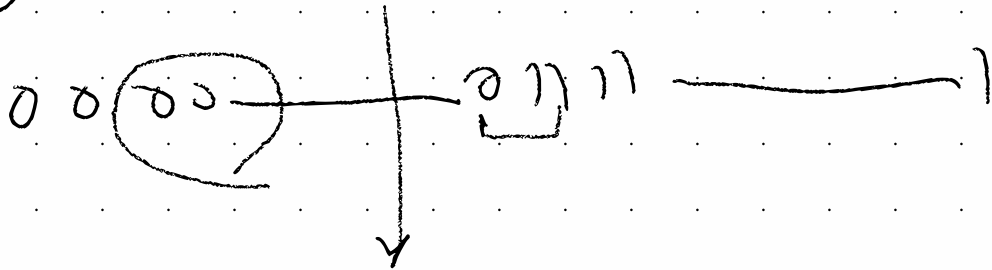
Beyond the state count

therefore, if  $\exists$  a long string that  
cannot be pumped  $\rightarrow$  lang  
is not regular



strings w/  $\frac{1}{n}$  # of 1s & 0s.

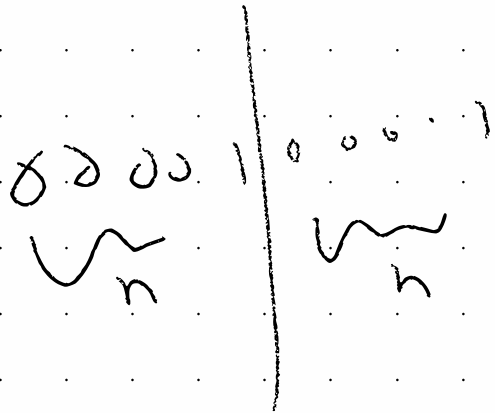
(10) 01010101010101010



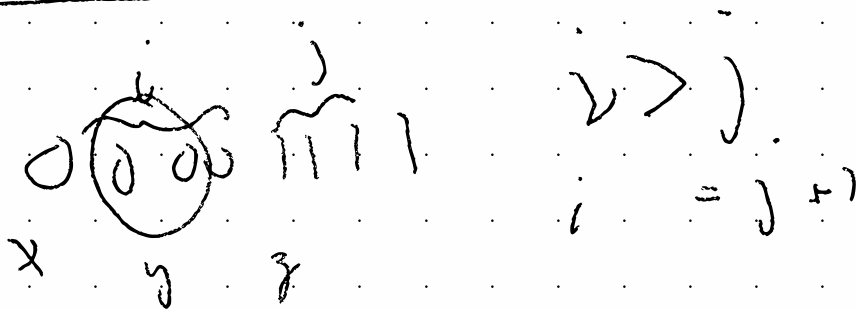
count 0's & 1's not possible

ww

← the same string ~~is~~  
doubled

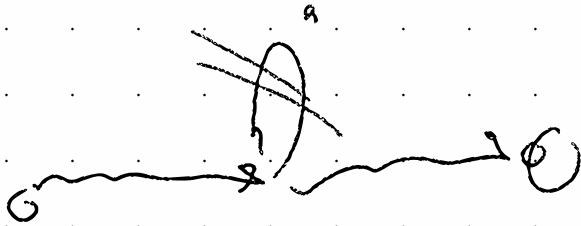


not regular



$$xyz = s = xyz^i z^i L$$

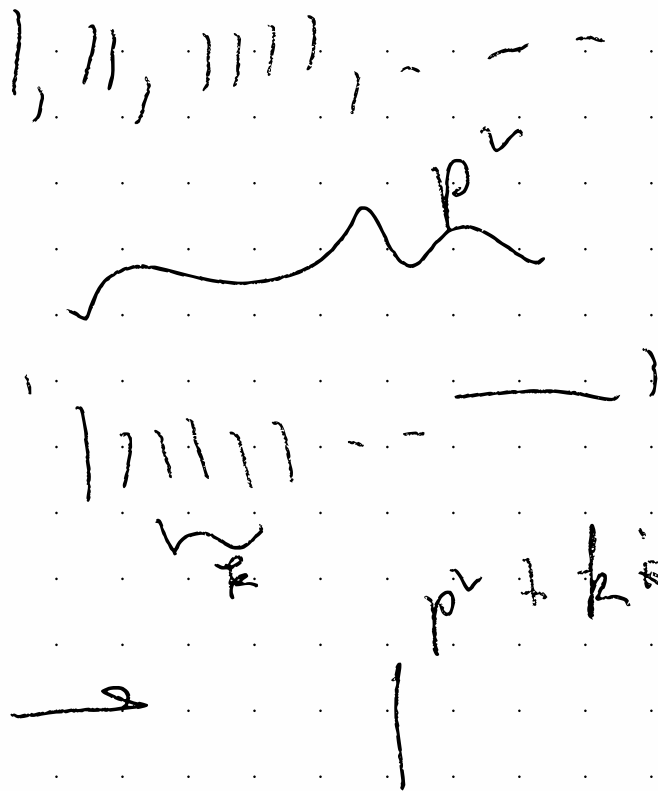
$$i \geq 0$$



$$\{ |n\rangle, n \geq 0 \}$$

$$\left\{ |1\rangle, |2\rangle, |3\rangle, |4\rangle, |5\rangle, |6\rangle, \dots \right\}$$

$$\{ |a+bi\rangle \mid i \geq 0 \}$$



$$(p+1)^2$$

$$p^2 + 2p + 1$$

$$k \leq p$$



