HW 4 due

Mon. 2/14

Prove $B = \{0^n 1^n \mid n \geq 0\}$ is not regular.

Suppose B is regular. Let p be the pumping length.

Choose $s = 0^p 1^p$

since $s \in B$ and $|s| > p$ by the pumping lemma s can be split into 3 pieces $s = xyz$ such that for $i \geq 0$ $xy^iz \in B$

3 cases

1. y is all 0's

so $xyyz$ has more 0's than 1's so is not in B.

eg. $s = \underbrace{000}_{x}\underbrace{0}_{y}\underbrace{1111}_{z}$

$xyyz = 0000001111$

$\overline{00001111}$
$\overline{y}$

2. y is all ones - see above

3. y has both 0's and 1's

$xyyz$ will have 0's and 1's out of order. $\notin B$

eg. $s = \underbrace{000}_{x}\underbrace{1}_{y}\underbrace{11}_{z}$ $\quad xyyz = 0001011 1 \notin B$

so s can't be "pumped"

$\therefore$ B is not regular.

$C = \{ w \mid w$ has an equal # of 0's and 1's$\}$

choose a string s of length $\geq p$.

$$s = 0^p 1^p$$

since $|xy| \leq p$ (by the pumping lemma)

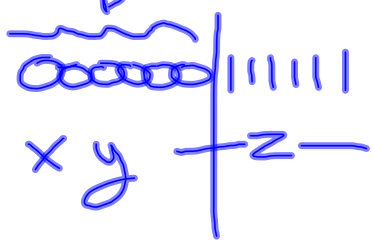
so y <u>must</u> be all 0's

so $xyyz$ will have more 0's than 1's

$xyyz \notin C$

$\therefore C$ is not reg. //

suppose p is 6



$$C \cap L(0^* 1^*) = 0^n 1^n$$

is not regular

$$D = \{ ww^R \mid w \in \{0,1\}^* \}$$

$s = \cancel{0^p 0^p}$ $\in D$ but maybe $xyyz \in D$

$s = \cancel{0 \| 0}$ no p.

✓ $s = 0^p \| 0^p$ $|xy| \le p$ y must be all 0's

$s = 0^p 1 0^p$ $\notin D$