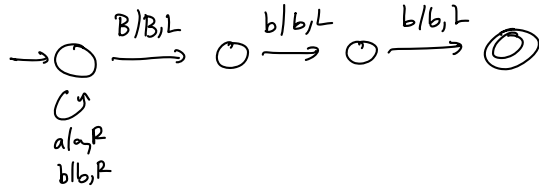


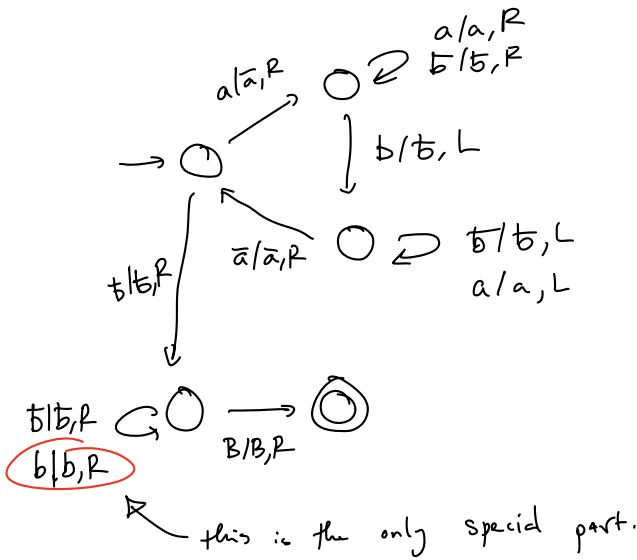
Math 3342 Homework #9

# 2a, 2d, 5, 6

#2a  $\{ xbb \mid x \in \{a,b\}^* \}$



#2d  $\{ a^n b^k \mid k \geq n \}$



$L = \{ (bab)^n b^n \}$

Let  $D_i = \frac{d}{d(bab)^i} L = \{ (bab)^{n-i} b^n \}$

These sets are all different for various  $i$ ,  
 so  $L$  has  $\infty$ -ly many derivatives,  
 so  $L$  is not regular.

6 a if  $\Sigma = \{a\}$ ,

$$\text{then } \{x a x^R\} = \{a^k a a^k\} = \{a^{2k+1}\},$$

which is regular because it has  
a regular expression  $(aa)^*a$

6 b let

$$D_i = \frac{d}{da^i} \{x a x^R\}$$

$$\text{let } x = a^i y \\ \text{so } x a x^R = a^i y a y^R a^i$$

$$= \frac{d}{da^i} \{a^i y a y^R a^i\}$$

$$= \{y a y^R a^i\}$$

These sets are all different for various  $i$ ,

so  $L$  has  $\infty$ -ly many derivatives,

so  $L$  is not regular.