

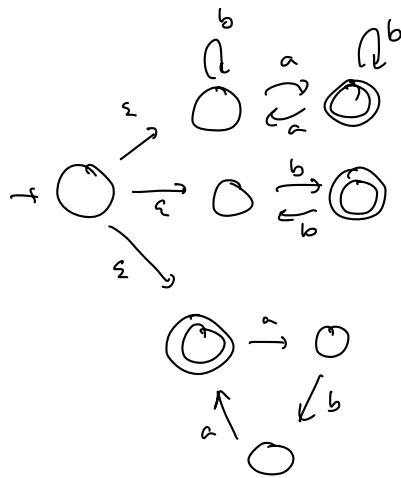
# Math 3342 Homework #4

Chapter 5 #5d, 7a, 10

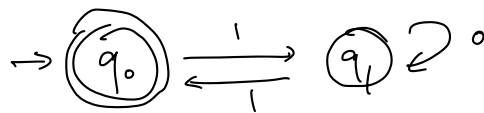
Extra questions #1

Chapter 5 #5d

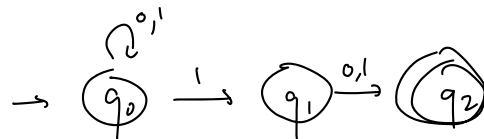
$$\{ \# \text{ a's is odd} \} \cup \{ b^n \mid n \text{ is odd} \} \cup \{ (aba)^n \}$$



Chapter 5 #7a



Chapter 5 #10



a)  $\delta^*(q_0, 010) = \{q_0, q_2\}$

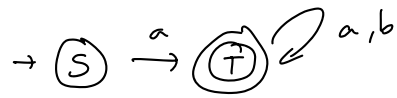
d)  $\delta^*(q_0, 1101) = \{q_0, q_2\}$

b)  $\delta(q_2, 0) = \emptyset$

e)  $\delta^*(q_0, 1011) = \{q_0, q_1, q_2\}$

c)  $\delta^*(q_2, \epsilon) = \{q_2\}$

#1



Accepts  $\{a^x\}$

Thm  $\delta^*(S, ax) \ni T$

PF by induction on  $n=|x|$

base case:  $|x|=0$ , so  $x=\epsilon$

$$\text{so } \delta^*(S, ax) = \delta^*(S, a) = \{T\} \ni T \quad \checkmark$$

induction: Assume  $\delta^*(S, ax) \ni T$  when  $|x|=k$ ,

WTS  $\delta^*(S, ax) \ni T$  when  $|x|=k+1$ .

Let  $|x|=k+1$ , say  $x=yl$  for  $|y|=k$  and  $l$  a single letter.

Then  $\delta^*(S, ay) \ni T$  by IH,

$$\text{so } \delta^*(S, ax) = \delta^*(S, ayl) \ni \delta^*(T, l)$$

$$= \{T\} \ni T$$

QED.