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## Homework 1

Q1.

a) False

Contradictory ex: we cannot represent  $5^{1/2}$ , and -12 which are real numbers.

b) False

Only countably many languages can be represented.

c) True

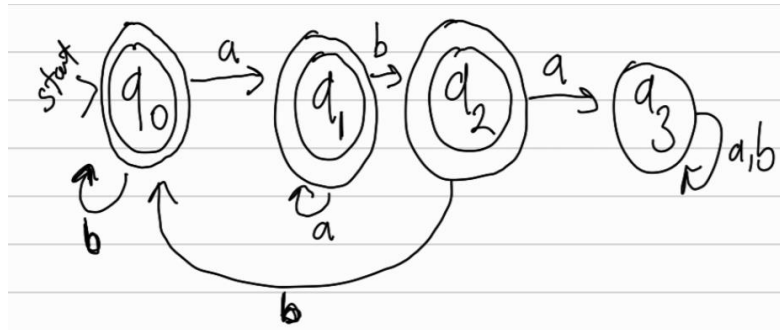
$a^0 b^2 a^1 b^0$

d) False

$a^+b^+$  means that there should be at least one a and one b in order but we cannot create a string with prefix "aab" which contradicts the statement.

Q2.

- a. To prevent misunderstanding and ease of readiness, I have added the following drawing.



$K : \{ q_0, q_1, q_2, q_3 \}$

$\Sigma : \{ a, b \}$

$s : q_0$

$F : \{ q_0, q_1, q_2 \}$

$\delta:$	a	b
<u>q0</u>	q1	q0
<u>q1</u>	q1	q2
<u>q2</u>	q3	q0
<u>q3</u>	q3	q3

- b.

we end up in q3, REJECT.

$(q_0, abbaabab) \mapsto$   
 $(q_1, bbaabab) \mapsto$   
 $(q_2, baabab) \mapsto$   
 $(q_0, aabab) \mapsto$   
 $(q_1, abab) \mapsto$   
 $(q_1, bab) \mapsto$   
 $(q_2, ab) \mapsto$   
 $(q_3, b) \mapsto$   
 $(q_3, e)$

Q3.

a)

$E(q)$  is the set of states that we can access using "e". For each state:

- 1)  $E(q_0): \{ q_0, q_2 \}$
- 2)  $E(q_1): \{ q_1 \}$
- 3)  $E(q_2): \{ q_2 \}$
- 4)  $E(q_3): \{ q_3, q_0, q_2 \}$
- 5)  $E(q_4): \{ q_4, q_3, q_0, q_2 \}$

b)

- 1) CORRECT

$$K' = K$$

- 2) CORRECT

$\Sigma' = \Sigma$  ( I assume  $\Sigma'$  does not include "e". If it does, then the statement is wrong since  $\Sigma$  does not contain "e" )

- 3) WRONG

$s' = E(s)$  which means  $s'$  is the set that we can reach by consuming "e"s to use all possible paths in case we start from  $s$ .

- 4) WRONG

$F' = \{ Q \subseteq K \mid Q \cap F \neq \emptyset \}$  is the formal definition. It is  $K$ , not  $K'$

- 5) WRONG

No, it returns the set of state  $p$  in  $K'$ . We should consider new states as well.