

Homework #3

1. (10 Points) True or False:

- a) $a a b a$ matches $a^* + b^*$ T F
- b) $babab$ matches $b(ab)^*$ T F
- c) If $A = \Phi$ then $A B = \Phi$ for all languages B T F
- d) If $A = \{\epsilon\}$ then $A B = \Phi$ for all languages B T F
- e) If $A = a^*$ and $\Sigma = \{a,b\}$, then $\Sigma^* - A = b^*$ T F

#2. (10 Points) Write regular expressions for the set of strings of 0's and 1's with at most one pair of consecutive 1's

#3. (10 Points) Draw the graph for the following DFA and then convert it to a regular expression.

	0	1
* → p	s	p
q	p	s
r	r	q
s	q	r

#4. (5 Points) Does $(R + S)^* S = (R^* S)^*$ Justify your answer

#5 - #6. Given R is a regular language and N is a non-regular language:

#5. (5 Points) Suppose X is a language such that $N = \sim X$ (\sim means complement). Does it follow that X must be regular? If so, state why. If not, does it follow that X must be non-regular? If so, state why. If neither of these is true name 1) a specific non-regular N such that $N = \sim X$ with X non-regular and 2) a specific non-regular N satisfying $N = \sim X$ with X regular.

#6. (5 Points) Suppose X is a language such that $X = R \cap N$. Does it follow that X must be regular? If so, state why. If not, does it follow that X must be non-regular? If so, state why. If neither of these is true name 1) a specific non-regular N and a regular R such that $X = R \cap N$ with X non-regular and 2) a specific non-regular N and a regular R satisfying $X = R \cap N$ with X regular.

#7. (5 Points) Create a dfa to accept $(0+1)^*1(0+1)^*$

#8. (Best answers will be posted to the bb) Name some applications in CS and in the world of:

- a) Regular expressions
- b) Converting regular expressions to finite automata
- c) Converting finite automata to regular expressions