Some exercises in preparation  
of Quiz 2  
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To be reviewed in class/recitation this week. No grade.

1 Exercise 1

Designing deterministic and non-deterministic FSA.

2 Exercise 2

Take non-deterministic finite state automaton given below. Construct an equivalent deterministic finite state automaton that accepts the same language, using the proof we learned in class for Theorem 1.19. That is, apply the algorithm for converting any NFA to an equivalent DFA, and provide the full-fledged description \((Q', \Sigma, q_0', \delta', F')\) and the simplified diagram of the resulting deterministic FSA. Assume that the alphabet is \(\{0,1\}\).

![Diagram of the NFA](image)

3 Exercise 3

The following two languages are regular. For each of them, draw its corresponding (deterministic or not) FSA diagram and show that its obeys the Pumping Lemma for the indicated strings.

a. \(\{w : w \text{ contains the sub-string 010}\}\).  
Pumping length = 4. Strings to be tested: 0101, 0010, 010, 01010.

b. \(\{w : w \text{ contains exactly three 0s (in any order)}\}\).  
Pumping length = 4. Strings to be tested: 011010, 00000, 010110, 01111.
4 Exercise 4

Show that the following language is not regular by using the Pumping Lemma (reasoning abstractly about $p$).

   a) $A = 01^n 01^m$, where $n < 3n$.

5 Exercise 5

The following sentence is several way ambiguous. Describe each reading in your own words (unambiguously) and design one Context Free Grammar that will generate the corresponding tree for each reading. [Take *one-eyed* as a single Adj, as the same for *one-horned*]

   One-eyed one-horned purple people eaters are here.

6 Exercise 6

Translate the paragraph (b) in Partee et al. p. 132 into Propositional Logic. If it forms a valid argument, give a proof of validity by using exclusively the rules of inference in p. 117 and the equivalences in p. 110.