#0. Name some alternative notations for
a) dfa’s
b) Extended transition function
c) Something else related to this module

(And it’s ok to post these to the bb)

#1. (10 Points) True or False:

a) Given a language (set of strings) L, the question: “Is it raining” is a decidable decision problem: T F
b) \( \delta^*(q,a) = \delta(q,a) \) where \( \delta^* \) is the extended transition function: T F
c) Languages accepted by NFA’s are closed under concatenation: T F
d) The smallest dfa accepting a* (where \( \Sigma = \{a\} \) has 2 states: T F
e) There may be more than 1 start state in an NFA: T F

#2. (10 Points) Given a DFA, \( M \), with transition function \( \delta \), prove by induction on \( |y| \) that \( \delta^*(q, xy) = \delta^* (\delta^*(q,x), y) \) for all states q and all strings x, y \( \in \Sigma^* \).
3. (10 Points) Convert the following NFA, $\mathcal{N}$, to a DFA, $\mathcal{M}$, and describe $\mathcal{L}(\mathcal{M})$ (which should also $\mathcal{L}(\mathcal{N})$).

$\mathcal{M}$:

![Diagram of a DFA](image)

#4. (10 points) Given: An Identifier consists of a Letter followed by any number of Letters or Digits, create a finite automaton to accept these Identifiers. Show a computation on the Identifier $R2d2$ and $2d2R$.

#5. (10 Points) a) Create a DFA that recognizes the set of all binary strings having a substring $00$.

   b) Create a DFA that recognizes the set of all binary strings ending in $01$. 
c) Create an NFA that will accept the set of all binary strings having a substring 0 0 or that end in 0 1.

d) Use the product construction to create a DFA that will accept the same language as in part c.

e) Use the Product Construction to create a DFA that will accept the set of all binary strings having a substring 0 0 and that end in 0 1.