Section 1.2: Nondeterministic Finite Automata

These exercises reflect material from our text, *Introduction to the Theory of Computation*, by Michael Sipser, PWS Publishing Co., 1997.

Definitions

Define each of the following concepts:

(a) Nondeterministic finite automaton, $N = (Q, \Sigma, \delta, q_0, F)$, with its states, alphabet, transition function, start state, and accept states

(b) State diagram of a nondeterministic finite automaton N

(c) $L(M)$, the language of an NFA N

(d) The NFA N accepts the string ω

(e) Computation of an NFA, N

(f) Equivalence of finite automata

(g) Power set, $\mathcal{P}(Q)$, of a set Q

Results

Prove or disprove:
Deterministic and nondeterministic automata recognize the same class of languages.

Prove or disprove:
Regular languages are closed under regular operations.

The following are the signatures of two types of transition functions:

$$\delta : Q \times \Sigma \to Q, \quad \text{and}$$

$$\delta : Q \times \Sigma_\epsilon \to \mathcal{P}(Q).$$

To what sorts of finite automata do they correspond?

Exercises

We will attempt to solve each of the following exercises as a community project in class today. Finish these solutions as homework exercises, write them up carefully and clearly, and hand them in at the beginning of the next class.

Exercises for Section 1.2, pages 84–85: 5, 6, 7, 8, 9, 10, 11, 12