Introduction to the Theory of Computation
Homework 5

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Due January, 27th

1. Use the closure properties of regular languages to show that $\{\mathtt{a}^i\mathtt{b}^j | i \neq j\}$ is not regular.

2. Exercise 1.51.

3. Let L be the language of balanced parentheses (e.g. ε, (), ()()(), ((()))). Describe an infinite set of strings that is pairwise distinguishable by L.

4. Minimize the following DFA. Your answer should include a table of equivalent states, and a transition diagram of the minimized DFA.
   $M = (Q, \Sigma, \delta, q_0, F)$ where
   $Q = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
   $\Sigma = \{\mathtt{a}, \mathtt{b}\}$
   $\delta : Q \times \Sigma \to Q$ is given by the following table.

q	$\delta(q, \mathtt{a})$	$\delta(q, \mathtt{b})$
1	2	3
2	4	9
3	5	4
4	6	4
5	5	7
6	9	7
7	8	5
8	7	6
9	9	8

   $q_0 = 1$
   $F = \{5, 6, 9\}$.

5. Exercise 2.1.

6. Exercise 2.4(b).