Main topics of the week:
  - Review problems for midterm

Problem: Let $\Sigma = \{0, 1\}$ and $A = \{ w \in \Sigma^* | w$ does not contain a pair of 1’s separated by an odd number of symbols$\}$. Show that $A$ is a regular language.

Proof:

Problem: Let $A$ be a regular language over the alphabet $\Sigma$. Show that $B = \{ x \mid x = yz$ for some $y \in A$ and some string $z \in \Sigma^* \}$ is a regular language.

Proof:

Problem: Let $A$ be the language $\{ a^ib^i a^k \mid k > i + j \}$. Prove that $A$ is not regular.

Proof:

Problem: Let $A$ be the language $\{ (ab)^n a^k \mid n > k$ and $k \geq 0 \}$. Prove that $A$ is not regular.

Proof:

Problem: Prove that the reverse of a regular language is a regular language.

Proof:

Problem: An All-Paths-NFA is a 5-tuple $(Q, \Sigma, \delta, q_0, F)$ like an NFA except that this automaton accepts a string if every possible computation of the string ends in an accept state. (Recall that in a regular NFA, if some computation ends in an accept state, then the string is accepted.) Prove that a language is regular if and only if it is recognized by an All-Paths-NFA.

Proof: