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 $B = \{ x | x = yz \text{ for some } y \in A \text{ and some string } z \in \Sigma^* \}$ is a regular language.

*Proof:*

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

*Proof:*

**Problem:** Let $A$ be the language $\{(ab)^n a^k | n > k \text{ and } k \geq 0 \}$. 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:*