Midterm Topics

1. DFA's, NFA's, REGEX and their equivalence to each other:
   (a) If L is recognized by an NFA then L is recognized by a DFA (powerset construction). So NFA $\subseteq$ DFA. Trivially DFA $\subseteq$ NFA so this gives NFA = DFA.
   (b) REGEX $\subseteq$ NFA. Given a REGEX we can build an NFA of it by induction on the length of the REGEX.
   (c) DFA $\subseteq$ REGEX. This is the $R(i, j, k)$ method.
2. Applications of Regular Languages.
   (a) Easy DFA's: number of a's $\equiv a \pmod{b}$, set of strings that begin with a certain prefix, end with a certain suffix.
   (b) DFA Classifiers for tricks for division (e.g., the DFA classifier that gives the remainder when dividing by 7).
   (c) Decidability of WS1S.
3. Proving languages NOT regular
   (a) Pumping Lemma
   (b) Using Closure