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 $\text{NFA} \subseteq \text{DFA}$. Trivially $\text{DFA} \subseteq \text{NFA}$ so this gives $\text{NFA} = \text{DFA}$.

   (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.