1. (0 points) What is your name? Write it clearly. Staple your HW. When is the midterm?

2. (30 points) Write a Regular Expression for the languages $A, B, C$ below. The alphabet is $\{a, b\}$.
   
   (a) $A = \{w \mid abab$ is a suffix of $w\}$
   (b) $B = \{w \mid$ the third to the last symbol of $w$ is a b$\}$
   (Examples: $aaabaa, abaaaaabab$.)

3. (30 points) Consider the following alternative proof that if $L$ is accepted by a DFA then $L$ has a regular expression.
   
   $L$ is accepted by DFA $(Q, \Sigma, \delta, s, F)$.
   
   Let $S(i, j, k)$ be the set of all string $w$ such that $\delta(i, w) = j$ via a route that uses AT MOST $k$ STATES AS INTERMEDIARIES
   
   (a) What is $S(i, j, 0)$.
   (b) Write $S(i, j, k)$ in terms of $S(i', j', k - 1)$ in such a way that this can used to prove that if all $S(i', j', k - 1)$ can be expressed as a regular expression then so can $S(i, j, k)$.

4. (40 points)
   
   (a) Write an NDFA for the language
   
   $$L_3 = \{w \mid$ the third to the last symbol of $w$ is a b$\}$$
   
   (b) Use the NDFA to DFA conversion to write a DFA for $L_3$. How many states does it have.
   
   (c) Let $n \in \mathbb{N}$. Write an NDFA for the language
   
   $$L_n = \{w \mid$ the $n$-to the last symbol of $w$ is a b$\}$$
   
   You may use DOT-DOT-DOT notation.
   
   (d) If you were to do the NDFA to DFA conversion for the DFA for $L_n$ then how many states would it have when minimized? Argue why this is true informally.