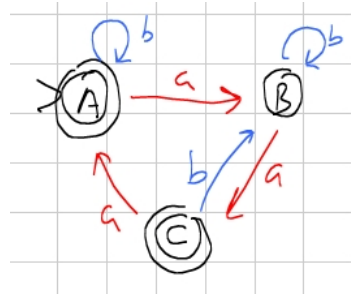
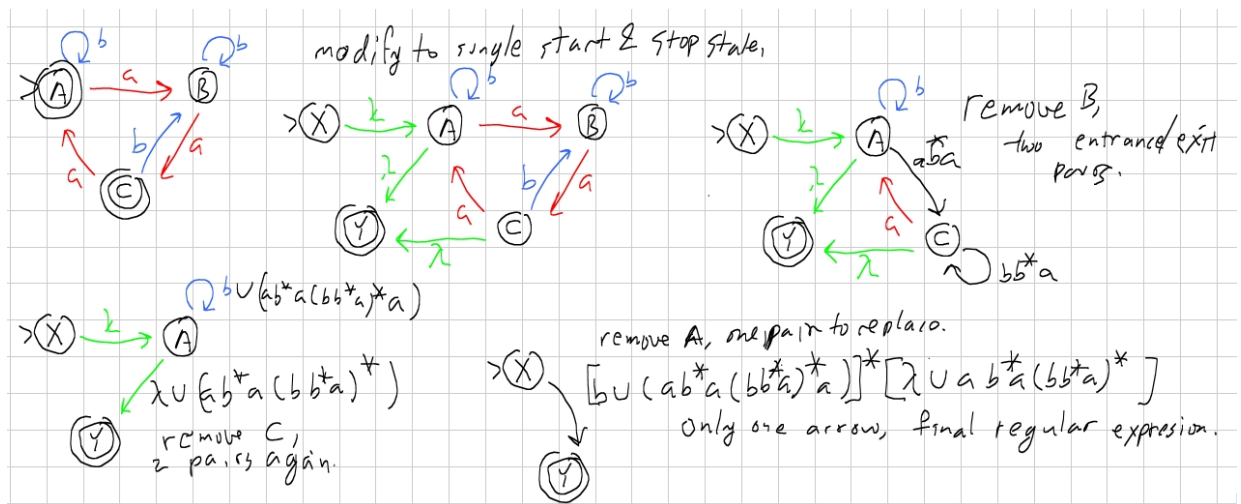




1. (7 pts) Consider the following Deterministic Finite Automaton.



Use expression graphs to determine a regular expression for its language. Show all steps in the process.



2. (3 pts) Consider the language $L = \{w \in \{a, b\}^* \mid w = a^i b^j; i < j\}$. Use the Finite State Test (any valid version) to show that L is not regular.

♣ We have to find a set of distinct strings, $u_i, i \in \mathbb{N}$ and for each pair $\{i, j\}$ string $v_{i,j}$ so that $u_i v_{i,j}$ and $u_j v_{i,j}$ are neither both in, nor both out of, L .

We can just take $u_i = a^i$, and for $\{i, j\}$, just take $v_{i,j} = b^k$, where $k = \max(i, j)$ is the larger of the two indices. Then one of $a^i b^k$ and $a^j b^k$ is in the language, because the b exponent is larger, and the other not, because the two exponents are equal. ♣