Final Problems 2

Due Friday October 9. REVISED Oct 4

1. (problem sent to /dev/null)

2. Let $A$ be an arbitrary regular language over alphabet $\Sigma = \{a, b\}$. Show that the following languages are also regular:

   $\text{SwapOne}(A) = \{ x \mid \exists y \in A : x \text{ and } y \text{ differ in exactly one character} \}$

   $\text{DropOne}(A) = \{ uv \mid \exists c \in \Sigma : uvc \in A \}$

   $= \{ x \mid \exists y \in A : x \text{ is the result of removing exactly 1 character from } y \}$

   $\text{AddOne}(A) = \{ ucv \mid c \in \Sigma \text{ and } uv \in A \}$

   $= \{ x \mid \exists y \in A : x \text{ is the result of adding exactly 1 character from } y \}$

3. Let $M = (Q, \Sigma, \delta, s, F)$ be a DFA.

   (a) For all $p, q \in Q$, show that the following language is regular:

   $A_{p, q} \overset{\text{def}}{=} \{ w \mid \widehat{\delta}(p, w) = q \}$

   (b) Remember the puzzle from the first lecture? A combobulation string for $M$ is any string such that after reading that string there is no doubt about which state $M$ is in, regardless of which state you started from. Show that the set of combobulation strings for $M$ is regular.