

Final Problems 2Due 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:

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

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

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

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

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

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:

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

- (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.