1: Closure Properties of Regular Languages

(a) (5pts) Give an FA (DFA or NFA) for the following language over alphabet $\Sigma = \{x, y\}$. Note the FA can be constructed by combining DFAs for simpler languages.

$$L_5 = \{w| \text{ has odd length or an even number of } x \text{ 's } \}$$

(b) (5pts)Give an FA for the following language over alphabet $\Sigma = \{x, y\}$. Note the FA can be constructed by combining DFAs for simpler languages.

$$L_6 = \{w| \text{ has odd length and an even number of } x \text{ 's } \}$$

Impair **(c)** (5pts) If L is a language over alphabet $\Sigma = \{0, 1\}$ then we define $Imp(L)$ as:

$$Imp(L) = \{w \in L| \text{ w has odd length}\}$$

- Let $L_1 = \{\epsilon, 0, 1, 00, 111, 1001, 00000\}$, what is $Imp(L_1)$?
- Show that the class of regular languages is closed under Imp (i.e. you need to show that for **any** regular language L, $Imp(L)$ is regular as well)

(d) (5pts) If L is a language then we define $DEL1(L)$ as:

$$DEL1(L) = \{w| \text{ if w can be obtained by deleting one symbol of a string in } L\}$$

- Let $L_1 = \{\epsilon, 1, 00, 101\}$, what is $DEL1(L_1)$?
- Show that the class of regular languages is closed under $DEL1$ (i.e. you need to show that for **any** regular language L, DEL1(L) is regular as well)