

CSC236 tutorial exercises, Week #9

best before Friday afternoon

1. Consider the languages $\text{NOBBB} = \{s \in \{a, b\}^* \mid s \text{ does not contain substring } bbb\}$, and $L = \{a, ab, ba\}^*$. Show that they are not equal by finding a string that belongs to one but not the other.
2. Recall the language $\mathcal{S} \subseteq \{y, u, h\}^*$ introduced in assignment 1, which was defined as the smallest set such that:
 - $u \in \mathcal{S}$
 - if $s \in \mathcal{S}$ then $ys \in \mathcal{S}$
 - if $s \in \mathcal{S}$ then $sh \in \mathcal{S}$
 - if $s_1, s_2 \in \mathcal{S}$ then $s_1s_2 \in \mathcal{S}$

Write a regular expression for \mathcal{S} .

3. Consider the language AA , consisting of all strings in $\{a, b\}^*$ that contain substring aa .
 - (a) Give a recursive definition of AA .
 - (b) Write a regular expression for AA .
 - (c) Write a regular expression for $\overline{\text{AA}}$, i.e. the language of strings which *don't* contain aa .
4. Describe a sufficient condition on languages S and T such that $ST = TS$. (This is not generally true - i.e. concatenation of languages is not commutative.)

Optional challenge: How many more conditions can you think of? Can you describe conditions that are *necessary* and sufficient?