CS3231
Tutorial 4

1. Which of the following languages are regular? Prove your answer. Below w^R denotes the reverse of w.

   (a) $\{wcw^R \mid w \in \{a, b\}^*\}$.

   (b) $\{ww \mid w \in \{a, b\}^*\}$.

   (c) $\{wxw^R \mid w, x \in \{a, b\}^+\}$.

   (d) $L = \{a^m b^r \mid m \le r \text{ or } m \ge 3r/2\}$.

2. Prove or Disprove:

   Suppose L_1, L_2 are regular and $L_1 = (L_2 - L_3) \cup (L_3 - L_2)$. Then L_3 is regular.

3. Use results done in class to show that $\{w \mid$ number of a's in w is same as number of b's in $w\}$ is not regular.

   Here try to do it without using pumping lemma, but obtaining the above result as a corollary to the results done in class.

4. Consider $L = \{b^m \mid m \ge 0\} \cup \{a^m b^p \mid m \ge 1, p \text{ is prime number}\}$. Show that L satisfies the pumping lemma. (However, L is not a regular language).

5. (Hard) For any language L, let $HALF(L) = \{w \mid (\exists u)[wu \in L \text{ and } |w| = |u|]\}$.

   Show that if L is regular, then $HALF(L)$ is regular.