## Tutorial #2

- 1. Show that the following languages are not regular.
  - (a)  $L = \{x \in \{0, 1\}^*$ : Number of 0s and 1s in x are the same  $\}$
  - (b)  $L = \{0^k : k \text{ is a composite number } \}$
  - (c)  $L = \{a^m b^n : gcd(m, n) = 1\}$
- 2. Let L be a language consisting of all strings  $x \in \{0,1\}^*$  such that the number of '01' and '10' in x are the same. This is counting overlapping appearances. (Eg : 010 is in the language but 0101 is not in the language). Is L regular. Consider the variant of the language L' with the same definition, where we do not count overlapping appearances. Is L' regular?