COMP170 Spring 2016 HW 1 - Due Monday February 1 11:59pm

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provide comp170 hw1 p1.pdf p2.pdf p3.txt p4.pdf p5.pdf
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Problem 1

Prove that every nontrivial, nonempty tree has at least two leaves.
Hint: Begin by considering the set of all paths in the tree.

Problem 2

Write a Turing machine (high level pseudo code) to decide the following language:

$$L = \{w \mid w \in \{0,1\}^* \text{ and } w \text{ contains at least twice as many 0's as 1's}\}$$

Problem 3 - Please see instructions on formatting your answer for this question

Write a Turing machine (at the implementation level, i.e. define Q, Σ, δ, etc.) to decide the language from problem 2:

$$L = \{w \mid w \in \{0,1\}^* \text{ and } w \text{ contains at least twice as many 0's as 1's}\}$$

Problem 4

Now assume that the RIGHT movement in a Turing machine is **replaced** by **DOUBLE-RIGHT** in the Turing machine, its transition function now has the form:

$$\delta : Q \times \Gamma \to Q \times \Gamma \times \{RR, L\}$$

At each point, the machine can move its head right two steps, or move its head left one step. Is this Turing machine variant equivalent to the standard version? Prove why or why not.

Problem 5

Now assume that both RIGHT and LEFT are **replaced** by **DOUBLE-RIGHT and DOUBLE-LEFT** in the Turing machine, its transition function now has the form:

$$\delta : Q \times \Gamma \to Q \times \Gamma \times \{RR, LL\}$$

At each point, the machine can move its head right two steps, or move its head left two steps. Is this Turing machine variant equivalent to the standard version? Prove why or why not.