Victoria Mo
COMS 4115
HW 1

3a Base case: () is balanced

Inductive case: if b is balanced, (b), ()b, and b() are balanced.

b Assume L is regular.

Let w be n (s followed by n)s

=> $|w| \geq n$ => $w = xyz$ s.t. 1) $y \neq \varepsilon$, 2) $|xy| \leq n$; $\forall k \geq 0, xy^k z \in L$

by (2), y must be i (s, where $i \geq 1$ (by (1))

However, then xy^2z would have more (s than)s

=> not balanced => proof by contradiction.

4 regex of length m, input string length n

Time complexity:

A state has at maximum 2 paths to transition to the next state and the number of states at a time is ≤ the ~~number of~~ total states. You need to do this for each of the characters of the string, therefore the time complexity is $O(mn)$.

Space complexity:

You only need $O(n)$ to store the input string, and then as each operand has two outgoing lines, storing would require $O(2^n + n)$