CS3311 Homework 3 (version 2)

Due date: Wednesday, February 5, 2014, in class

The answers must be the original work of the author. While discussion with others is permitted and encouraged, the final work should be done individually. You are not allowed to work in groups. You are allowed to build on the material supplied in the class. Any other source must be specified clearly.

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1. *(40 points)* Let L be the language over $\Sigma = \{a, b, +, (,)\}$ generated by the following recursive definition:

> **basis:** $a \in L$
>
> **recursive step**: If $(w \in L)$ then $w + b$ is in L, and (w) is in L.
>
> **closure**: A string $w \in L$ only if it can be obtained from the basis set by a finite number of applications of the recursive step.

Use induction to prove that all the strings in L have an odd length.

2. *(40 points)* For each of the following two regular sets, show if the ten strings below are in the language.

$\lambda, a, b, aa, ab, ba, bb, aaa, aba, aaaa$

If the string is in the language, show one way it could be obtained. If the string is not in the language, explain the reason as clearly as possible.

> **(a)** $\{aa\}^*\{bb\}^*\{a\}^*$
>
> **(b)** $\{aa\}^*\{bb\}^*\{a\}$

3. *(20 points)* Let L over $\Sigma = \{v, a, r, 1, 2\}$ be the language where every string starts with a number and every v is followed by ar.

> **(a)** Give a recursive definition for L.
>
> **(b)** Give a regular set for L.