CS3133
Homework #4

I worked with:

I consulted:

#1. a) Given the following PDA, M:

$Q = \{q_0, q_1, q_2\}$
$\Sigma = \{a,b\}$
$\Gamma = \{A\}$
$F = \{q_1, q_2\}$

$\delta(q_0,a,\lambda) = \{[q_0,A]\}$
$\delta(q_0, \lambda,\lambda) = \{[q_1, \lambda]\}$
$\delta(q_0,b,A) = \{[q_2, \lambda]\}$
$\delta(q_1, \lambda,A) = \{[q_1, \lambda]\}$
$\delta(q_2, b,A) = \{[q_2, \lambda]\}$
$\delta(q_2, \lambda,A) = \{[q_2, \lambda]\}$

a) Draw the graph and table for M

b) Trace the computations of *aab, abb, aba, aabb*

b) What is L(M)?

#2. a) Construct a PDA to accept $\{a^{2i}b^i \mid i \geq 0\}$

b) Show computations on *a a b* and *a b b*

#3. a) Show that context free languages are closed under reversal. Use your method for $L = \{a^nb^n \mid n \geq 0\}$

#4. Use the pumping lemma to show that $L = \{w\, w^R\, w \mid w \in \{a,b\}^*\}$ is not context-free.

#5. Given a transition function $\delta(q,a)$, defined on a symbol *a*:

a) (1 point) Define the extended transition function $\delta^*(q,w)$, defined on strings *w* (you may use either the text's definition or the one used in class)

b) (7 points) Prove using induction that $\delta^*(q, w_1w_2) = \delta^*(\delta^*(q,w_1),w_2)$. State clearly what you are doing the induction on, set the proof up clearly and give reasons for each step.

c) (2 points) Use part b and the fact that $\delta^*(q,a) = \delta(q,a)$ to show $\delta^*(q,aw) = \delta^*(\delta(q,a),w)$