COMP 412 Fall 2009
Homework 2 **Due: Wednesday, Nov11th**

Problem 1 (42 points)
The grammar below is a simplified version of the fourth problem in your first homework. Construct canonical sets, the ACTION and GOTO tables for this grammar.

GOAL	→	LIST
LIST	→	LIST :: ELEM | EMPTYLIST
EMPTYLIST	→	**nil**
ELEM	→	**lparen data rparen** | **lparen rparen**

Problem 2 (30 points)
Consider the following attribute grammar:

Num	→	$SignList$	$List.pos = 0$ **if** $Sign.neg$ **then** $Num.val = -List.val$ **else** $Num.val = List.val$
$Sign$	→	$+$	$Sign.neg = false$
	|	$-$	$Sign.neg = true$
$List_0$	→	Tri	$Tri.pos = List_0.pos$ $List_0.val = Tri.val$
	|	$List_1 Tri$	$List_1.pos = List_0.pos + 1$ $Tri.pos = List_0.pos$ $List_0.val = List_1.val + Tri.val$
Tri	→	0	$Tri.val = 0$
	|	1	$Tri.val = 1 * 3^{Tri.pos}$
	|	2	$Tri.val = 2 * 3^{Tri.pos}$

(a) Show the parse tree that would be built for the sentence "-2012"

(b) Draw the attribute dependence graph for the sentence.

(c) Identify the synthesized attributes and the inherited attributes. Justify your answer.

(d) Sketch an evaluation method for the attributes.

(e) Show the values your method would assign to each attribute, and the order in which they would be assigned.

Problem 3 (28 points)
Let language $\mathfrak{L}$ be the language of all the strings that start with the literal **a**, followed by any number (including zero) of alternating **a**'s and **b**'s (**abab**...) and finally followed by an additional instance literal **b**. For instance, **aababb**, **ab** $\in \mathfrak{L}$

(a) Provide the regular expression describing $\mathfrak{L}$

(b) Build the NFA for (a) using Thompson's construction

(c) Build the DFA for (b) using subset construction

(d) Build the unique minimal DFA for (c) using Hopcroft's algorithm