

# Complexité avancée - TD 2

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## Exercise 1: Dyck's language

- Let  $A$  be the language of balanced parentheses – that is the language generated by the grammar  $S \rightarrow (S) | SS | \epsilon$ . Show that  $A \in L$ .
- What about the language  $B$  of balanced parentheses of two types? that is the language generated by the grammar  $S \rightarrow (S) | [S] | SS | \epsilon$

## Exercise 2: Restrictions of the SAT problem

1. Let 3-SAT be the restriction of SAT to clauses consisting of at most three literals (called 3-clauses). In other words, the input is a finite set  $S$  of 3-clauses, and the question is whether  $S$  is satisfiable. Show that 3-SAT is NP-complete for logspace reductions (assuming SAT is).
2. Let 2-SAT be the restriction of SAT to clauses consisting of at most two literals (called 2-clauses). Show that 2-SAT is in P, using proofs by resolution.
3. Show that 2-UNSAT (i.e, the unsatisfiability of a set of 2-clauses) is NL-complete.
4. Conclude that 2-SAT is NL-complete. You may use that  $\text{co-NL} = \text{NL}$ .