

Logic

Exercise Sheet 2

Exercise 2.1

- a) Find a (linear or quadratic) decision procedure for propositional formulas involving only `Atom` and `Iff`. *Hint: Recall that `Iff` is associative and commutative.*
- b) Prove that your decision procedure returns true iff the input formula is a tautology.
- c) Implement the procedure in OCaml.

Exercise 2.2 Functional completeness

A set A of logical connectives is called *functionally complete* iff every boolean-valued function can be expressed as a formula with just connectives from A .

- a) Show that $\{\wedge, \vee, \neg\}$ is functionally complete.
- b) Show that $\{\wedge, \vee\}$ is not functionally complete.
- c) Show that $\{\overline{\wedge}\}$ is functionally complete, where $p \overline{\wedge} q$ is interpreted as $\neg(p \wedge q)$