

Exercise Sheet 6

Propositional Logic – Logical Equivalences & Normal Forms & SAT

Let p, q, r, s, t be atoms.

1. Convert $((p \wedge q) \rightarrow r) \rightarrow (p \vee \neg r)$ to a DNF using a truth table.
2. Convert $((p \wedge q) \rightarrow r) \rightarrow (p \vee \neg r)$ to a CNF using a truth table.
3. Convert $((p \wedge q) \rightarrow r) \rightarrow (p \vee \neg r)$ to a CNF using standard equivalences (i.e., using the equivalences listed on slide 10 of lecture 8), as we did on slide 26 of lecture 8.
4. Using the DPLL algorithm, check whether the following formula is satisfiable:

$$(p \vee t \vee s) \wedge (q \vee r \vee \neg s \vee \neg t) \wedge (p \vee \neg q \vee s) \wedge (p \vee q \vee r \vee \neg t) \\ \wedge (q \vee r \vee \neg s) \wedge (\neg p \vee \neg s \vee \neg t) \wedge (\neg p \vee \neg q \vee s \vee \neg r) \wedge (\neg r \vee t)$$

Detail your answer by explaining the choices and simplifications you make in each step.