

Note on integrity: You may discuss problems with fellow students, but all written work must be entirely your own, and should not be from any other course, present or past. If you use a solution from another source you must cite it, including from other people who help you.

Reading

Read pp. 1–24 in Smullyan for next Tuesday.

Questions

- (1) Do Exercise 1 in Smullyan (p.13):

Let F be a formula containing a formula X as a part and $F[Y/X]$ denote the formula that results from F by replacing one (or more) occurrences of X by the formula Y .

Prove for any formula F that $F[Y/X]$ is truth functionally equivalent to F (written as $F[Y/X] \equiv F$) if $Y \equiv X$

- (2) Do Exercise 5 in Smullyan (p.14) for the Sheffer stroke operator $|$.
(Read Exercise 4 for a definition of “definable”.)

Bonus: Do the same for \downarrow , the joint denial operator.

- (3) Use the DPLL procedure to check whether the following formulas are satisfiable and provide satisfying valuations if they are.

(a) $(\neg p \vee \neg q \vee r) \wedge (p \vee \neg q \vee r) \wedge (p \vee q \vee \neg r) \wedge (p \vee q \vee r) \wedge (\neg p \vee q \vee \neg r) \wedge (p \vee \neg q \vee \neg r) \wedge (\neg p \vee q \vee r)$

(b) $(x \vee y \vee \neg z \vee t \vee u) \wedge (\neg x \vee y \vee z \vee \neg t \vee u) \wedge (x \vee \neg y \vee z \vee t \vee \neg u) \wedge (y \vee z \vee t \vee \neg u) \wedge (y \vee z \vee \neg t \vee u) \wedge (y \vee \neg z \vee \neg u) \wedge (\neg y \vee \neg z \vee u) \wedge (x \vee y \vee z \vee u) \wedge (\neg x \vee \neg y \vee \neg u) \wedge (x \vee y \vee u) \wedge (\neg x \vee \neg y \vee u) \wedge (x \vee y \vee t) \wedge (x \vee \neg z \vee t) \wedge (\neg x \vee z \vee \neg t \vee u)$