Exercise 3: Semantic Equivalence

Given a set of atomic statements $A$ and the set of all boolean expressions $T_A$ that can be formed out of $A$, demonstrate that the following statements are true for every boolean expression $T$ out of $T_A$:

(a) $T \land \lnot T \equiv 0$
(b) $T \lor \lnot T \equiv 1$
(c) $0 \land T \equiv 0$
(d) $1 \land T \equiv T$

12 Points

Exercise 4: Syntactic and Semantic Level

Given a set of atomic statements $A = \{A, B, C\}$ and the following boolean expressions:

- $T_1 := (A \land B) \rightarrow C$
- $T_2 := (A \rightarrow B) \rightarrow (A \rightarrow C)$

Demonstrate the semantic equivalence of $T_1$ and $T_2$ over $A$

(a) on the syntactic level (by conversion, equivalent to the examples in the script with explanations for each step),
(b) on the semantic level (using truth tables).

Hint:
In addition to the semantic equivalence according to the script you can use the type of equivalence as used in Exercise 3 and the equivalences $1 \lor T \equiv 1$ and $0 \lor T \equiv T$.

8 Points