Mini-project II

Jonas Smedegaard[1]

[1]Roskilde University, Department of People and Technology

2026-04-24

Question 1

The truth table for the negation of Exercise 1.2.14 from Rosen's book, i.e. the formula $\neg((\neg p \land (p \to q)) \to \neg q)$, is shown below.

p	q	$\neg p$	$p \to q$	$\neg p \land (p \to q)$	$\neg q$	$(\neg p \land (p \to q)) \to \neg q$	$\neg((\neg p \land (p \to q)) \to \neg q)$
T	T	F	T	F	F	T	F
T	F	F	F	F	T	T	F
F	T	T	T	T	F	F	T
F	F	T	T	T	T	T	F

The table shows that $\neg((\neg p \land (p \to q)) \to \neg q)$ is satisfiable. Specifically, The two leftmost columns and the rightmost column show that the formula is satisfied when p is true and q is false.

This can be expressed as the function v with domain $\{p, q, \neg, \land, \to\}$, codomain $\{0, 1\}$ and the following mapping:
$v(\neg x) = 1$ if $v(x) = 0$, and 0 otherwise.
$v(x \land y) = 1$ if $v(x) = 1$ and $v(y) = 1$, and 0 otherwise.
$v(x \to y) = 0$ if $v(x) = 1$ and $v(y) = 0$, and 1 otherwise.

Question 2

The function $v(x \vee y)$ can be expressed in set-theoretic notation as

$\{B_1, \ldots, B \cup \{\phi \vee \psi\}, \ldots, B_i\} \rightsquigarrow \{\cancel{\{}B_1, \ldots, B \cup \{\phi\}, \ldots, B_i\cancel{\}}, \cancel{\{}B_1, \ldots, B \cup \{\psi\}, \ldots, B_i\cancel{\}}\}$

and the function $v(x \rightarrow y)$ can be expressed as

$\{B_1, \ldots, B \cup \{\phi \rightarrow \psi\}, \ldots, B_i\} \rightsquigarrow \{\{B_1, \ldots, B \cup \{\neg\phi\}, \ldots, B_i\}, \{B_1, \ldots, B \cup \{\psi\}, \ldots, B_i\}\}$

Question 3

TODO

Question 4

TODO

Question 5

TODO