

Opgave 5.31(g) $p \wedge (q \vee r) \vdash (p \wedge q) \vee (p \wedge r)$

1	$p \wedge (q \vee r)$	ass
2	p	$\wedge E, 1$
3	$(q \vee r)$	$\wedge E, 1$
4	q	ass
5	$(p \wedge q)$	$\wedge I, 2, 4$
6	$(p \wedge q) \vee (q \vee r)$	$\vee I, 5$
7	r	ass
8	$(p \wedge r)$	$\wedge I, 2, 7$
9	$(p \wedge q) \vee (q \vee r)$	$\vee I, 8$
10	$(p \wedge q) \vee (q \vee r)$	$\vee I, 1, 6, 9$

Opgave 5.32(2) $p \wedge (q \wedge r) \vdash r \wedge p$

1	$p \wedge (q \wedge r)$	ass
2	p	$\wedge E, 1$
3	$(q \wedge r)$	$\wedge E, 1$
4	r	$\wedge E, 3$
5	$(r \wedge p)$	$\wedge I, 2, 4$

(3) $p \rightarrow (q \wedge r), q \rightarrow s, p \vdash s$

1	$p \rightarrow (q \wedge r)$	ass
2	$q \rightarrow s$	ass
3	p	ass
4	$(q \wedge r)$	$\Rightarrow E, 1, 3$
5	q	$\wedge E, 4$
6	s	$\Rightarrow E, 2, 5$

Opgave 5.33

$$(2) \varphi \vee (\psi \wedge \chi); (\varphi \vee \psi) \wedge (\varphi \vee \chi)$$

$$\begin{array}{c} \varphi \vee (\psi \wedge \chi) \circ (\varphi \vee \psi) \wedge (\varphi \vee \chi) \\ | \\ \varphi \vee (\psi \wedge \chi) \circ (\varphi, \psi) \wedge (\varphi, \chi) \\ | \\ \varphi \vee (\psi, \chi) \circ (\varphi, \psi) \wedge (\varphi, \chi) \end{array}$$

Opgave 5.37

$$(2) \varphi \leftrightarrow \psi; (\varphi \rightarrow \psi) \wedge (\psi \rightarrow \varphi)$$

$$\begin{array}{c} (\neg p \rightarrow (\neg q \wedge r)) \\ \swarrow \quad \searrow \\ \neg p \quad (\neg q \wedge r) \\ | \quad \swarrow \quad \searrow \\ p \quad \neg q \quad r \\ \quad | \\ \quad q \end{array}$$

$$(3) \varphi \rightarrow \psi; \neg \psi \rightarrow \neg \varphi$$

$$\begin{array}{c} (\neg p \rightarrow (\neg q \wedge r)) \\ \swarrow \quad \searrow \\ \neg p \quad (\neg q \wedge r) \\ | \quad \swarrow \quad \searrow \\ p \quad \neg q \quad r \\ \quad | \\ \quad q \end{array}$$

Opgave 5.38

$$(3) ((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$$

$$\begin{array}{c} (\neg p \rightarrow (\neg q \wedge r)) \\ \swarrow \quad \searrow \\ \neg p \quad (\neg q \wedge r) \\ | \quad \swarrow \quad \searrow \\ p \quad \neg q \quad r \\ \quad | \\ \quad q \end{array}$$

Opgave 5.53

Geef de semantische tableauregels voor de Quine dolk †.