

Opgave 5.31

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

1	$p \wedge (q \vee r) \vdash (p \wedge q) \vee (p \wedge r)$				
2		$\exists x P(x)$			
3			u	$P(u)$	
4				$\forall y \neg P(y)$	R, 1
5				$\neg P(u)$	$\forall E, 4$
6				\perp	$\neg E, 3, 5$
7			\perp		$\exists E, 2, 3-6$
8		$\neg \exists x P(x)$			$\neg I, 2-7$

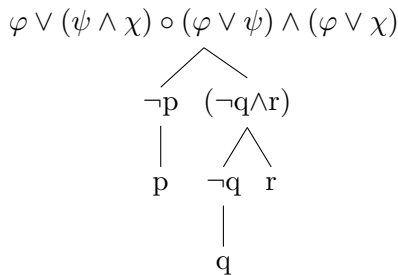
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(2) $p \wedge (q \wedge r) \vdash r \wedge p$

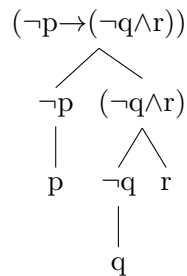
(3) $p \rightarrow (q \wedge r), q \rightarrow s, p \vdash s$

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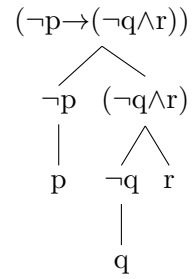
(2) $\varphi \vee (\psi \wedge \chi); (\varphi \vee \psi) \wedge (\varphi \vee \chi)$

**Opgave 5.37**

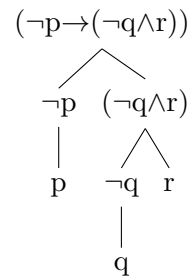
(2) $\varphi \leftrightarrow \psi; (\varphi \rightarrow \psi) \wedge (\psi \rightarrow \varphi)$



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

**Opgave 5.38**

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

**Opgave 5.53**

Geef de semantische tableauregels voor de Quine dolk \dagger .