$$\{p_i | i \in N\}$$
$$F_{\neg}(\alpha) = (\neg \alpha)$$
$$\vee, \wedge, \rightarrow F_{\Box}(\alpha, \beta) = (\alpha \Box \beta)$$

(T,F

$$p_0 \vee p_2$$

T F

T

F F

F

$$V : \{p_i | i \in N\} \rightarrow \{T, F\}$$
$$\widehat{V}$$
$$\widehat{V} : WFF \rightarrow \{T, F\}$$
$$\widehat{V}$$

$$\widehat{V}(p_i) = v(p)$$

$$\alpha = (\neg \beta)$$
$$TT_{\neg} : \{T, F\} \rightarrow \{T, F\}$$
truth table
$$TT_{\neg}(T) = F$$
$$TT_{\neg}(F) = T$$

β	$\neg\beta$
T	F
F	T

$$\widehat{V}$$
$$\widehat{V}(\neg(\alpha)) = TT_{\neg}(\widehat{V}(\alpha))$$

$$\alpha = (\beta \vee \gamma)$$
$$\widehat{V}(\alpha) = TT_{\vee}(\widehat{V}(\beta), \widehat{V}(\gamma))$$
$$TT_{\vee}(T, T) = T$$
$$TT_{\vee}(T, F) = T$$
$$TT_{\vee}(F, T) = T$$
$$TT_{\vee}(F, F) = F$$

α	β	$\alpha \vee \beta$
T		T
T		T
F		T
F		F

$$\alpha = (\beta \lor \gamma)$$

$$\widehat{V}(\alpha) = TT_\land(\ \underbrace{\widehat{V}(\beta)}_{\text{truth of sub}}\ ,\ \underbrace{\widehat{V}(\gamma)}_{\text{truth of sub}}\ )$$

$$TT_\land(T,T) = T$$

$$TT_\land(\tfrac{T}{\frac{F}{F}}, \tfrac{F}{\frac{T}{F}}) = F$$

α	β	$\alpha \land \beta$
T		T
T	F	F
F	T	F
F	F	F

$$\alpha = (\beta \to \gamma)$$

$$\overset{\gamma\beta}{\widehat{V}((\beta \to \gamma)) = TT_\to(\widehat{V}(\beta), \widehat{V}(\gamma))}$$

β	γ	$\beta \to \gamma$
T		T
T		F
F		T
F		T

$$A \to B$$
$$\text{F T}$$

$$V : \{p_i | i \in \mathbb{N}\} \to \{T, F\}$$
$$\widehat{V} : WFF \to \{T, F\}$$

$$\widehat{V}(\alpha) = V(\alpha)\alpha = p_i$$
$$\widehat{V}(\alpha) = TT_\neg(\widehat{V}(\beta))\alpha = (\neg\beta)$$
$$\widehat{V}(\alpha) = TT_\Box(\widehat{V}(\beta), \widehat{V}(\gamma))\alpha = (\beta\Box\gamma)$$
$$v$$
$$\widehat{V}(\alpha)\alpha$$
$$\text{``v``}\alpha$$
$$(TT_\Box)$$

v •

$TT_\Box$ •

$\neg$ •

$\leftrightarrow, \land, \lor$ •

$$\rightarrow \bullet$$

$$((\neg p_0) \vee p_1)\neg p_0 \vee p_1$$
$$\alpha \mathrm{v} \widehat{V}(\alpha) = T$$
$$v| = \alpha$$
$$\mathrm{T}\alpha$$
$$\neg\alpha \vee \alpha\neg p_o \vee p_o$$

T

P_0	$\neg p_0$	$\neg p_0 \vee p_0$
T	F	T
F	T	T

$$\alpha \vee \neg\alpha$$
$$\widehat{V}(\alpha \vee \neg\alpha) = TT_\vee(\widehat{V}(\alpha), \widehat{V}(\neg\alpha)) =$$
$$TT_\vee(\widehat{V}(\alpha), TT_\neg(\widehat{V}(\alpha))$$

$$TT_\vee(T, F) = T \Leftarrow TT_\neg(\widehat{V}(\alpha)) = F \Leftarrow V(\alpha) = T$$

$$TT_\vee(F, T) = T \Leftarrow TT_\neg(\widehat{V}(\alpha)) = T \; \Leftarrow V(\alpha) = F$$
$$| = \alpha \vee \neg\alpha$$

$$(\alpha \rightarrow \beta) \rightarrow (\neg\beta \rightarrow \neg\alpha)$$

T
$$\alpha \in WFF$$
$$v_2, v_1$$
$$v_1(p_i) = v_2(p_i)\alpha$$
$$\widehat{V_1}(\alpha) = \widehat{V_2}(\alpha)$$

α, β	$\neg\beta\neg\alpha$	$\alpha \rightarrow \beta$	$\neg\beta \rightarrow \neg\gamma$	$(\alpha \rightarrow \beta) \rightarrow (\neg\beta \rightarrow \neg\gamma)$
T,T	F,F	T	T	T
T,F	T,F	F	F	T
F,T	F,T	T	T	T
F,F	T,T	T	T	T

$$(\alpha \rightarrow \beta) \rightarrow (\neg\beta \rightarrow \neg\alpha)$$
$$\mathrm{v}$$

$\widehat{V}()$

$\Rightarrow$

$\widehat{V}(\alpha \to \beta) = T$

$\widehat{V}(\neg\beta \to \neg\alpha) = F$

$TT_\neg(\widehat{V}(\beta)) = \widehat{V}(\neg\beta) = T$

$TT_\neg(\widehat{V}(\alpha)) = \widehat{V}(\neg\alpha) = F$

$\Rightarrow$

$\widehat{V}(\beta) = F, \widehat{V}(\alpha) = T$

$\widehat{V}(\alpha \to \beta) = F$

Fv

$\alpha \vee \neg\gamma$

$\neg(\alpha \wedge \neg\alpha)$

$((\alpha \vee (\beta \wedge \gamma)) \leftrightarrow ((\alpha \vee \beta) \wedge (\alpha \vee \gamma)))$

$(\alpha \wedge (\beta \vee \gamma)) \leftrightarrow (\alpha \wedge \beta) \vee (\alpha \wedge \gamma)$

$\neg(\alpha \vee \beta) \leftrightarrow (\neg\alpha \wedge \beta)$

$\neg(\alpha \wedge \beta) \leftrightarrow (\neg\alpha \vee \neg\beta)$

F

$\alpha \wedge \neg\alpha$

$\alpha\beta = \neg\alpha$

$\widehat{V}((\neg\alpha)) = TT_\neg(\widehat{V}(\alpha)) = TT_\neg(T) = F$

α

p_0

$\neg\alpha \Leftrightarrow \alpha$

$\alpha \Leftrightarrow \neg\alpha$

X

X

$v \models \alpha, \forall \alpha \in X, \Leftrightarrow v| = X$

$v \models \bigwedge_{\alpha \in X} \alpha$

X

$$\beta\alpha$$
$$\alpha\beta$$
$$\beta| = \alpha$$
$$\text{``}\subseteq\text{''}$$

Eror 404 "white board erased"

$$\models \alpha \to \beta\alpha \models \beta$$
$$\models \alpha \to \beta$$
$$\alpha \models \beta\text{``}$$
$$v \models \alpha$$
$$v \models \beta$$

$$\widehat{V}(\alpha) = T$$
$$\widehat{V}(\beta) = F$$
$$\widehat{V}(\alpha \to \beta) = F$$
$$TT_{\to}(T, F) = F$$
$$\alpha \to \beta$$

$$x \in A/(B/C) \Leftrightarrow$$
$$x \in A \wedge x \notin (B/C) \Leftrightarrow$$
$$x \in A \wedge x \notin B \wedge x \in C \Leftrightarrow$$
$$x \in (A/B) \cup x \in A \cap C$$