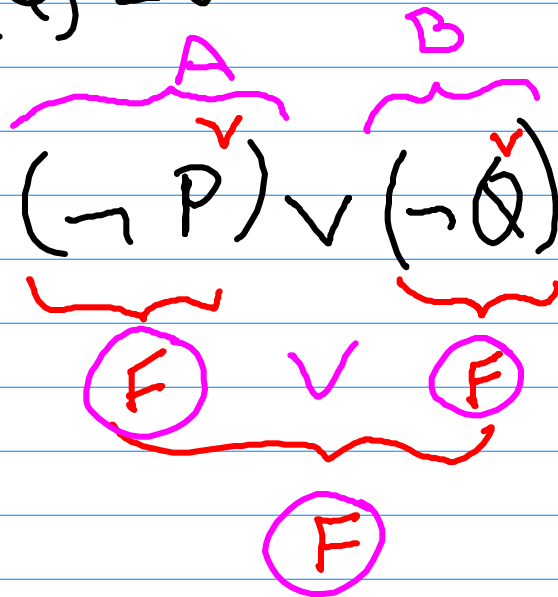


$$VL(P) = V$$

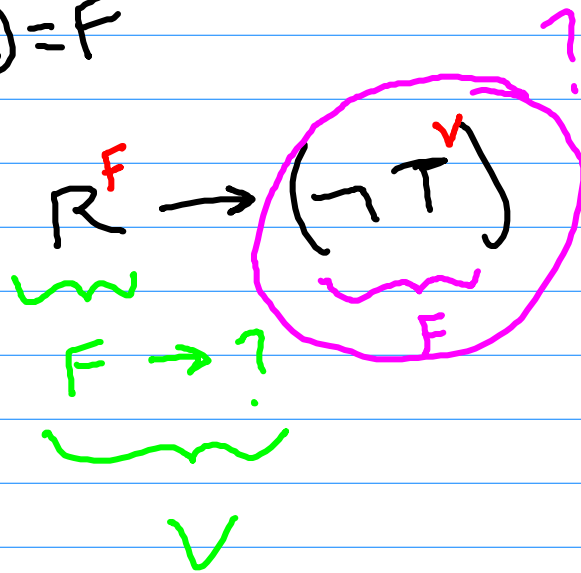
$$VL(Q) = V$$



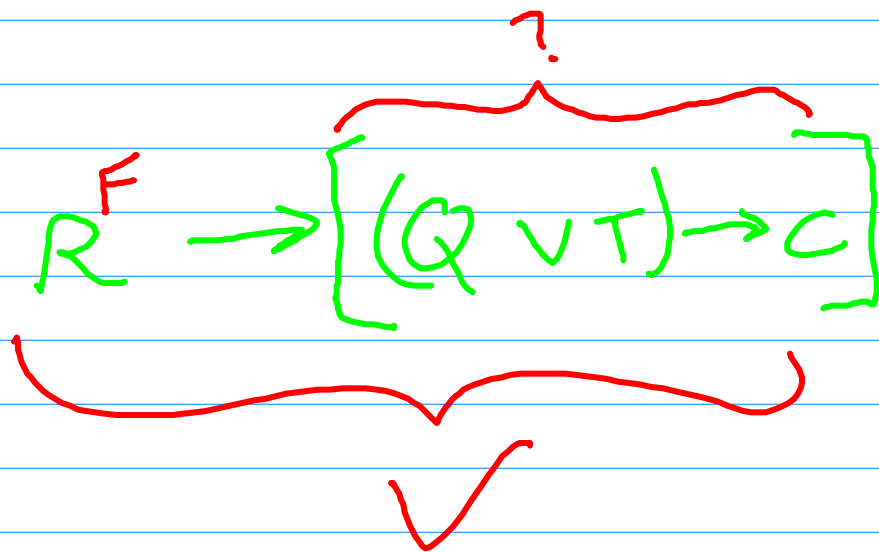
A	B	$A \vee B$
V	V	V
V	F	V
F	V	V
F	F	F

$$VL(T) = V$$

$$VL(R) = F$$



P	Q	$P \rightarrow Q$
V	V	V
V	F	F
F	V	V
F	F	V



$$(P \wedge Q) \vee R$$

P

V

V

V

V

F

F

F

F

Q

V

V

F

F

V

V

F

F

R

V

F

V

F

V

F

V

F

$$\textcircled{a} \\ P \wedge Q$$

V

V

F

F

F

F

F

F

$$(P \wedge Q) \vee R \\ \textcircled{a} \vee R$$

V

V

V

F

V

F

V

F

$$VL(P) = V$$

$$VL(Q) = V$$

$$VL(R) = F$$

$$(P \wedge R) \rightarrow \neg Q$$

F

→

F
F

V
F
V
F

V
F
V
V

V

A

B

A → B

V

V

V

V

F

F

F

V

V

F

F

V

→

$$VL(A) = V$$

$$VL(C) = V$$

$$VL(B) = F$$

$$[A^V \wedge (B^F \rightarrow C^V)] \leftrightarrow [\neg A^V \wedge (B^F \vee C^V)]$$

Handwritten truth evaluation for the left side of the biconditional:

- A^V is V.
- $B^F \rightarrow C^V$ is V (since F \rightarrow V is V).
- $A^V \wedge (B^F \rightarrow C^V)$ is V \wedge V = V.

Handwritten truth evaluation for the right side of the biconditional:

- $\neg A^V$ is F.
- $B^F \vee C^V$ is F \vee V = V.
- $\neg A^V \wedge (B^F \vee C^V)$ is F \wedge V = F.

The biconditional result is V \leftrightarrow F = F.

A	B	$A \leftrightarrow B$
V	V	V
V	F	F
F	V	F
F	F	V

$$VL(p) = V$$

$$VL(q) = F$$

$$VL(r) = F$$

A	B	$A \rightarrow B$
V	V	V

$$P(p, q, r) = (q \leftrightarrow (r \rightarrow \neg p)) \vee ((\neg q \rightarrow p) \leftrightarrow r)$$

Handwritten truth evaluation for the expression above:

- For the first part: $q \leftrightarrow (r \rightarrow \neg p)$
 - $q = F$, $r = V$, $\neg p = V$
 - $r \rightarrow \neg p = V \rightarrow V = V$
 - $q \leftrightarrow (r \rightarrow \neg p) = F \leftrightarrow V = F$
- For the second part: $((\neg q \rightarrow p) \leftrightarrow r)$
 - $\neg q = V$, $p = V$
 - $\neg q \rightarrow p = V \rightarrow V = V$
 - $r = F$
 - $(\neg q \rightarrow p) \leftrightarrow r = V \leftrightarrow F = F$
- Final result: $F \vee F = F$

$$\neg(p \vee q) \vee \neg(q \leftrightarrow p)$$

P	Q	$p \vee q$	$\neg(p \vee q)$	$q \leftrightarrow p$	$\neg(q \leftrightarrow p)$	$a \vee b$
V	V	V	F	V	F	F
V	F	V	F	F	V	V
F	V	V	F	F	V	V
F	F	F	V	V	F	V