

Logic

1 Not \neg

1.1 Definition

$$\begin{aligned}\neg a &= \neg[a] := \\ \neg[\mathbb{T}] &\rightarrow \mathbb{F} \\ \neg[\mathbb{F}] &\rightarrow \mathbb{T}\end{aligned}$$

2 Logical And \wedge

2.1 Definition

$$\begin{aligned}a \wedge b &= \wedge[a, b] := \\ \neg(\exists \mathbb{F} \in \{a, b\}) &= \\ \nexists \mathbb{F} \in \{a, b\}\end{aligned}$$

2.2 Alternate Definition

$$\begin{aligned}\wedge[\mathbb{F}, \mathbb{F}] &= \mathbb{F} \\ \wedge[\mathbb{F}, \mathbb{T}] &= \mathbb{F} \\ \wedge[\mathbb{T}, \mathbb{F}] &= \mathbb{F} \\ \wedge[\mathbb{T}, \mathbb{T}] &= \mathbb{T}\end{aligned}$$

3 Law of Non-Contradiction

Introduce the symbol for contradiction, proof by contradiction

4 All Logical Functions Can Be Built from Not And

4.1 Proof

5 Criticism logical union, set union, logical and, set and

Verify on Wiki

- logical or is a function logical and is a function
- language muks up our understanding

Logical or \vee is different from \cup Logical and \wedge is different from \cap

Logical or, only one has to be true

Logical and, both have to be true \rightarrow I'll take the intersection

Set and, I'll take bag 1 and bag 2 i'll take both \rightarrow I'll take the union

set or, I'll take bag 1 or bag 2 I'll take just one

Do we ever confuse set union, set and with logical or, and?

(Don't we describe set union \cup as "or")

Appendix

6 Logical Or \vee

6.1 Definition

$$a \vee b = \vee[a, b] :=$$

$$\exists T \in \{a, b\}$$

6.2 Alternate Definition

$$\vee[\mathbb{F}, \mathbb{F}] = \mathbb{F}$$

$$\vee[\mathbb{F}, \mathbb{T}] = \mathbb{T}$$

$$\vee[\mathbb{T}, \mathbb{F}] = \mathbb{T}$$

$$\vee[\mathbb{T}, \mathbb{T}] = \mathbb{T}$$

7 Exclusive Or (Xor)

7.1 Definition

7.2 Alternate Definition

8 Not Or (Nor)

8.1 Definition

8.2 Alternate Definition

9 Exclusive Nor (Xnor)

9.1 Definition

9.2 Alternate Definition

10 Not And (Nand)

10.1 Definition

10.2 Alternate Definition