Phil 120, Review Notes

Stuff

May 23, 2021

Contents

1 References

1.1 BasicLogic Operators

The followings are for A * B, where '*' is an operator, A is top row, B is left column.

$\wedge$	T	F
T	T	F
F	F	F

AND. Conjuction. A $\wedge$ B is true only when both A and B are true.

$\vee$	T	F
T	T	T
F	T	F

OR. Disjunction. A $\vee$ B is true when either A or B, or Both are true.

$\rightarrow$	T	F
T	T	T
F	F	T

IMPLIES. If A then B. A implies B.
A implies B is true when A is true and B is true, or when A is false.
Note: $A \rightarrow B = \neg A \vee B$

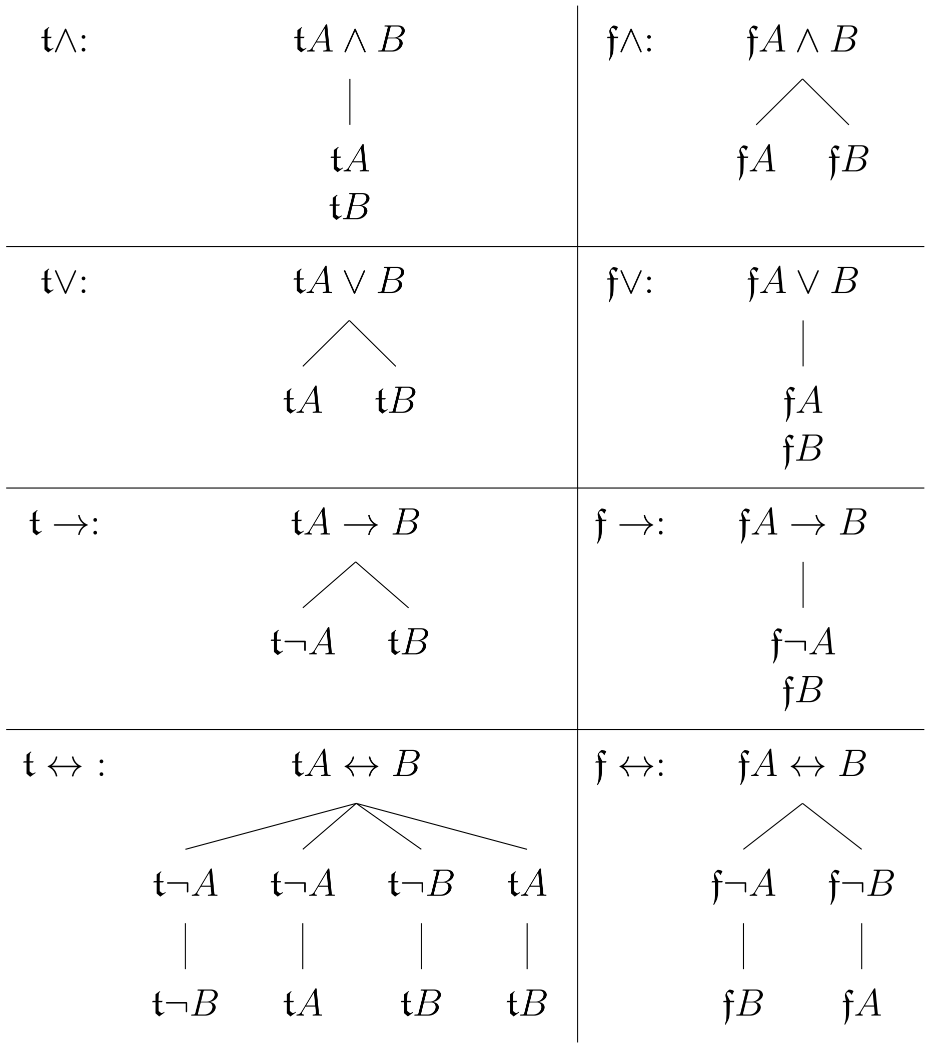
$\leftrightarrow$	T	F
T	T	F
F	F	T

IFF, A if and only B. A is logically equivalent, two way implication.
A $\leftrightarrow$ B is true exactly when the truth value of A is the same as B.
Note: $A \leftrightarrow B = (A \rightarrow B) \wedge (B \rightarrow A) = (A \wedge B) \vee (\neg A \wedge \neg B)$

1.2 Some Logic Identities

$A \vee \neg A = T$	Excluded Middle, either A or not A must be true.
$\neg(A \wedge \neg A)$	Non-contradiction. It is true that not both A and not A hold at the same time.
$A \rightarrow B, A \implies B$	Modus ponenes, to prove. If A implies and B and A is true, then B is true.
$A \rightarrow B, \neg B \implies \neg A$	Modus tollens, to disprove. If the conclusion is false, then the premise is false also.
$A \vee B, \neg A \implies B$	Disjunctive syllogism. If at least one of A or B is true, then if one of them is false, the other must be true.
$(A \rightarrow B) \iff (\neg B \rightarrow \neg A)$	Contrapositive. Similar to Modus tollens.
$A, \neg A \implies B$	Explosion. From a false premise you can arrive at any conclusion.
$\neg(A \vee B) \iff \neg A \wedge \neg B$ $\neg(A \wedge B) \iff \neg A \vee \neg B$	De Morgan's Law.
$A \vee (B \wedge C) \iff (A \vee B) \wedge (A \vee C)$ $A \wedge (B \vee C) \iff (A \wedge B) \vee (A \wedge C)$	Distributability

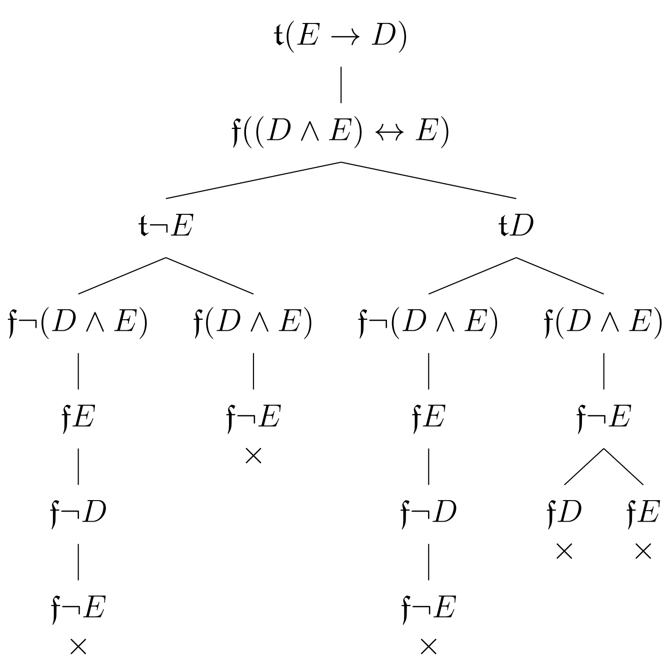
1.3 Tableaux Identities



Note:

- Use De Morgan's Law to deal with negations($\neg$), also, $\neg(A \rightarrow B) = (\neg B \wedge A)$.
- To prove a consequence, set the premise to true, conclusion to false. This proves that there is no possible counter example, since the negation is never satisfied.
  - If there are atomic branches left open, then those are valid counter examples.
- A branch is closed any of following pairs occurs in a branch: $\{(\mathfrak{f}A, \mathfrak{t}A), (\mathfrak{f}A, \mathfrak{f}\neg A), (\mathfrak{t}A, \mathfrak{t}\neg A)\}$, use a '$\times$' to indicate a closed branch.

Example: Use tableaux to prove $(E \rightarrow D) \vdash_1 ((D \wedge E) \leftrightarrow E)$



Since all branches are closed, the negation of the conclusion is never satisfied, thus the relation always holds for all values D and E might take on.