



Theory of Inference

Method of Contradiction

In order to show that a conclusion C follows logically from the premises H_1, H_2, \dots, H_m , we assume that C is false and consider $\neg C$ as an additional premises. If the new set of premises gives contradict value, then the assumption $\neg C$ is true does not hold simultaneously with $H_1 \wedge H_2 \wedge \dots \wedge H_m$ being true.

Method of Contrapositive

In order to prove $H_1 \wedge H_2 \wedge \dots \wedge H_m \Rightarrow C$,

if we prove $\neg C \Rightarrow \neg (H_1 \wedge H_2 \wedge \dots \wedge H_m)$

then the original problem follows. This method is called contrapositive method.



Rule of Inference

Rule P : A premise may be introduced at any point in the derivation

Rule T : A formula S may be introduced at any point in a derivation if S is tautologically implied by any one or more of the preceding formulas.

Rule CP : If S can be derived from R and set of premises, then $R \rightarrow S$ can be derived from the set of premises alone.



Implication Rules

$$1. a) P, P \rightarrow Q \Rightarrow Q$$

$$b) \neg Q, P \rightarrow Q \Rightarrow \neg P$$

$$c) \neg P, P \vee Q \Rightarrow Q$$

$$2. P \rightarrow Q, Q \rightarrow R \Rightarrow P \rightarrow R$$

$$3. P, Q \Rightarrow P \wedge Q$$

$$P \wedge Q \Rightarrow P, Q$$

$$P, Q \Rightarrow P \vee Q$$

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

$$P \rightarrow \neg Q, Q \Rightarrow \neg P$$



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