

Math 300 Intro Math Reasoning
Worksheet 01: Mathematical logic

(1) Prove that $P \implies Q$ and $\neg Q \implies \neg P$ are logically equivalent but that $P \implies Q$ and $Q \implies P$ are not logically equivalent.

(2) Prove that $\neg(P \wedge Q)$ and $(P \wedge \neg Q) \vee \neg P$ are logically equivalent.

(3) Prove that $P \iff Q \equiv (P \implies Q) \wedge (Q \implies P)$.

(4) Suppose that $\alpha \equiv T$ and $\beta \equiv F$, for each of the following determine if weather they are a tautology or a contradiction:

(1) $(\beta \wedge \alpha) \Rightarrow \beta$.

(2) $\beta \wedge (\alpha \Rightarrow \beta)$.

(5) Decide whether the conclusion follows from the premises:

- Pre. 1: $A \Rightarrow (B \Rightarrow C)$
- Pre. 2: $\neg B \vee (\neg C)$
- Conclusion $\neg B \vee \neg A$.