

Equivalent Forms

Here we are interested in determining if two formulas are necessarily equivalent (based on their logical structure and references to the same simpler propositions).

1.1.9: Suppose P , Q , R , and S are propositional forms, P is equivalent to Q , and R is equivalent to S . For each pair of forms, determine whether they are necessarily equivalent. If they are, explain why.

(a) P and R

(d) $P \vee S$ and $Q \vee R$

(b) P and $\sim\sim Q$

(e) $\sim(P \wedge S)$ and $\sim Q \vee \sim R$

(c) $P \wedge S$ and $Q \wedge R$

(f) $P \wedge Q$ and $S \wedge R$

1.2.8: Prove the following parts of Theorem 1.2.2 by showing the following pairs of statements are equivalent for propositions P and Q .

(a) $P \implies Q$ and $\sim P \vee Q$

(d) $\sim(P \wedge Q)$ and $P \implies \sim Q$

(b) $P \iff Q$ and $(P \implies Q) \wedge (Q \implies P)$

(e) $\sim(P \wedge Q)$ and $Q \implies \sim P$

(c) $\sim(P \implies Q)$ and $P \wedge \sim Q$

(f) $P \implies (Q \implies R)$ and $(P \wedge Q) \implies R$