

Logic

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DeMorgan's Laws

$\neg(P \wedge Q)$ is equivalent to $\neg P \vee \neg Q$.

$\neg(P \vee Q)$ is equivalent to $\neg P \wedge \neg Q$.

Commutative Laws

$P \wedge Q$ is equivalent to $Q \wedge P$.

$P \vee Q$ is equivalent to $Q \vee P$.

Associative Laws

$P \wedge (Q \wedge R)$ is equivalent to $(P \wedge Q) \wedge R$.

$P \vee (Q \vee R)$ is equivalent to $(P \vee Q) \vee R$.

Idempotent Laws

$P \wedge P$ is equivalent to P .

$P \vee P$ is equivalent to P .

Distributive Laws

$P \wedge (Q \vee R)$ is equivalent to $(P \wedge Q) \vee (P \wedge R)$.

$P \vee (Q \wedge R)$ is equivalent to $(P \vee Q) \wedge (P \vee R)$.

Absorption Laws

$P \vee (P \wedge Q)$ is equivalent to P .

$P \wedge (P \vee Q)$ is equivalent to P .

Double Negation Law

$\neg\neg P$ is equivalent to P .

Tautology Laws

$P \wedge (\text{a tautology})$ is equivalent to P .

$P \vee (\text{a tautology})$ is a tautology.

$\neg(\text{a tautology})$ is a contradiction.

Contradiction Laws

$P \wedge (\text{a contradiction})$ is a contradiction.

$P \vee (\text{a contradiction})$ is equivalent to P .

$\neg(\text{a contradiction})$ is a tautology.

Conditional Laws

$P \rightarrow Q$ is equivalent to $\neg P \vee Q$.

$P \rightarrow Q$ is equivalent to $\neg(P \wedge \neg Q)$.

Contrapositive Laws

$P \rightarrow Q$ is equivalent to $\neg Q \rightarrow \neg P$.

Biconditional Laws

$P \leftrightarrow Q$ is equivalent to $(P \rightarrow Q) \wedge (Q \rightarrow P)$.

Quantifier Negation Laws

$\neg \exists x P(x)$ is equivalent to $\forall x \neg P(x)$

$\neg \forall x P(x)$ is equivalent to $\exists x \neg P(x)$