

3.4 List of important logical equivalences

Let p , q , and r be two propositions. T is a tautology and F is a contradiction.

Logical equivalence	Name
$\neg(\neg p) \Leftrightarrow p$	Double negation
$p \vee p \Leftrightarrow p$ $p \wedge p \Leftrightarrow p$	Idempotent 1 Idempotent 2
$p \vee q \Leftrightarrow q \vee p$ $p \wedge q \Leftrightarrow q \wedge p$	Commutativity 1 Commutativity 2
$p \vee (q \vee r) \Leftrightarrow (p \vee q) \vee r$ $p \wedge (q \wedge r) \Leftrightarrow (p \wedge q) \wedge r$	Associativity 1 Associativity 2
$p \vee (q \wedge r) \Leftrightarrow (p \vee q) \wedge (p \vee r)$ $p \wedge (q \vee r) \Leftrightarrow (p \wedge q) \vee (p \wedge r)$	Distributivity 1 Distributivity 2
$\neg(p \wedge q) \Leftrightarrow \neg p \vee \neg q$ $\neg(p \vee q) \Leftrightarrow \neg p \wedge \neg q$	De Morgan's law 1 De Morgan's law 2
$p \vee F \Leftrightarrow p$ $p \vee T \Leftrightarrow T$ $p \wedge F \Leftrightarrow F$ $p \wedge T \Leftrightarrow p$	Absorption law 1 Absorption law 2 Absorption law 3 Absorption law 4
$\neg T \Leftrightarrow F$ $\neg F \Leftrightarrow T$ $p \vee \neg p \Leftrightarrow T$ $p \wedge \neg p \Leftrightarrow F$	Complement law 1 Complement law 2 Complement law 3 Complement law 4
$p \rightarrow q \Leftrightarrow (\neg p) \vee q$ $p \rightarrow q \Leftrightarrow \neg q \rightarrow \neg p$	Implication law 1 Implication law 2
$(p \leftrightarrow q) \Leftrightarrow (p \rightarrow q) \wedge (q \rightarrow p)$	Equivalence law