Propositional Calculus

Demorgan's laws

$\neg(P \wedge Q) \equiv \neg P \vee \neg Q$

$\neg(P \vee Q) \equiv \neg P \wedge \neg Q$

Commutative laws

$P \wedge Q \equiv Q \wedge R$

$P \vee Q \equiv Q \vee R$

Associative laws

$P \wedge (Q \wedge R) \equiv (P \wedge Q) \wedge R$

$P \vee (Q \vee R) \equiv (P \vee Q) \vee R$

Distributive laws

$P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$

$P \vee (Q \wedge R) \equiv (P \vee Q) \wedge (P \vee R)$

Implication

$P \rightarrow Q \equiv \neg P \vee Q$

$P \leftrightarrow Q \equiv \left(P \rightarrow Q\right) \wedge \left(Q \rightarrow P\right) \equiv (\neg P \vee Q) \wedge (\neg Q \vee P)$

Other important laws

$\neg \neg P \equiv P$

$\neg P \vee P \equiv T$

$\neg P \wedge P \equiv F$

$P \vee T \equiv T$

$P \wedge T \equiv P$

$P \vee F \equiv P$

$P \wedge F \equiv F$

Simplification

$P \wedge Q \Rightarrow P \ or \ Q$

Addition

$P \ or \ Q \Rightarrow P \vee Q$

Hypothetical Syllogism

$\left(P \rightarrow Q\right) \wedge \left(Q \rightarrow R\right) \Rightarrow P \rightarrow R$

Modus Ponens

$\left(P \rightarrow Q\right) \wedge P \Rightarrow Q$

Modus Tollens

$\left(P \rightarrow Q\right) \wedge \neg Q \Rightarrow \neg P \ or \ \left(P \rightarrow \neg Q\right) \wedge Q \Rightarrow \neg P$

Disjunctive Syllogism

$(P \vee Q) \wedge \neg P \Rightarrow Q \ or \ (P \vee Q) \wedge \neg Q \Rightarrow P$