

Equivalences	
Identity Laws	$p \wedge \mathbf{T} \equiv p$ $p \vee \mathbf{F} \equiv p$
Domination Laws	$p \vee \mathbf{T} \equiv \mathbf{T}$ $p \wedge \mathbf{F} \equiv \mathbf{F}$
Idempotent Laws	$p \vee p \equiv p$ $p \wedge p \equiv p$
Commutative Laws	$p \vee q \equiv q \vee p$ $p \wedge q \equiv q \wedge p$
Associative Laws	$(p \vee q) \vee r \equiv p \vee (q \vee r)$ $(p \wedge q) \wedge r \equiv p \wedge (q \wedge r)$
Distributive Laws	$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$
De Morgan's Laws	$\neg(p \wedge q) \equiv \neg p \vee \neg q$ $\neg(p \vee q) \equiv \neg p \wedge \neg q$
Negation Laws	$p \vee \neg p \equiv \mathbf{T}$ $p \wedge \neg p \equiv \mathbf{F}$
Double Negation Law	$\neg\neg p \equiv p$
Contrapositive Law	$p \rightarrow q \equiv \neg q \rightarrow \neg p$
Implication Law	$p \rightarrow q \equiv \neg p \vee q$
Quantifier Negation Laws	$\neg\exists x P(x) \equiv \forall x \neg P(x)$ $\neg\forall x P(x) \equiv \exists x \neg P(x)$

Propositional and Predicate Equivalences

Inferences		
Modus Ponens	[e $\rightarrow$ ]	$\frac{p, p \rightarrow q}{\therefore q}$
Direct Proof	[a $\rightarrow$ ]	$\frac{p \Rightarrow q}{\therefore p \rightarrow q}$
Simplification	[e $\wedge$ ]	$\frac{p \wedge q}{\therefore p, q}$
Consolidation	[a $\wedge$ ]	$\frac{p, q}{\therefore p \wedge q}$
Disjunctive Syllogism	[e $\vee$ ]	$\frac{p \vee q, \neg p}{\therefore q}$
Addition	[a $\vee$ ]	$\frac{p}{\therefore p \vee q, q \vee p}$
Excluded Middle		$\frac{}{\therefore p \vee \neg p}$
Universal Instantiation	[e $\forall$ ]	$\frac{\forall x P(x)}{\therefore P(c) : c \text{ arbitrary}}$
Universal Generalization	[a $\forall$ ]	$\frac{P(c) : c \text{ arbitrary; no dependency}}{\therefore \forall x P(x)}$
Existential Instantiation	[e $\exists$ ]	$\frac{\exists x P(x)}{\therefore P(c) : c \text{ new and specific; depends on ...}}$
Existential Generalization	[a $\exists$ ]	$\frac{P(c) : c \text{ specific or arbitrary}}{\therefore \exists x P(x)}$

Propositional and Predicate Inferences