Boolean Identities

Double Negation:	p	$\equiv$	$\neg(\neg p)$
Equivalence:	$(p \equiv q)$	$\equiv$	$(p \rightarrow q) \wedge (q \rightarrow p)$
Idempotence:	$(p \wedge p)$	$\equiv$	p
	$(p \vee p)$	$\equiv$	p
DeMorgan1:	$(\neg(p \wedge q))$	$\equiv$	$(\neg p \vee \neg q)$
DeMorgan2:	$\neg(p \vee q)$	$\equiv$	$(\neg p \wedge \neg q)$
Commutativity of *or*:	$(p \vee q)$	$\equiv$	$(q \vee p)$
Commutativity of *and*:	$(p \wedge q)$	$\equiv$	$(q \wedge p)$
Associativity of *or*:	$(p \vee (q \vee r))$	$\equiv$	$((p \vee q) \vee r)$
Associativity of *and*:	$(p \wedge (q \wedge r))$	$\equiv$	$((p \wedge q) \wedge r)$
Distributivity of *and* over *or*:	$(p \wedge (q \vee r))$	$\equiv$	$((p \wedge q) \vee (p \wedge r))$
Distributivity of *or* over *and*:	$(p \vee (q \wedge r))$	$\equiv$	$((p \vee q) \wedge (p \vee r))$
Conditional Disjunction:	$(p \rightarrow q)$	$\equiv$	$(\neg p \vee q)$
Contrapositive:	$(p \rightarrow q)$	$\equiv$	$(\neg q \rightarrow \neg p)$

Boolean Inference Rules

Modus Ponens:	From p and $p \rightarrow q$,	infer q	
Modus Tollens:	From $p \rightarrow q$ and $\neg q$,	infer $\neg p$	. . .
Disjunctive Syllogism:	From $p \vee q$ and $\neg q$,	infer p	. . .
Simplification:	From $p \wedge q$,	infer p	. . .
Addition:	From p,	infer $p \vee q$	. . .
Conjunction:	From p and q,	infer $p \wedge q$	
Hypothetical Syllogism:	From $p \rightarrow q$ and $q \rightarrow r$,	infer $p \rightarrow r$	
Contradictory Premises:	From p and $\neg p$,	infer q	
Resolution:	From $p \vee q$ and $\neg p \vee r$,	infer $q \vee r$	. . .
Conditionalization:	Assume premises A. Then, if $(A \wedge p)$ entails q,	infer $p \rightarrow q$	

A Useful Axiom

Law of the Excluded Middle: $p \vee \neg p$

Quantifier Exchange

Quantifier Exchange A:	$\neg(\forall x(P(x)))$	$\equiv$	$\exists x(\neg P(x))$
Quantifier Exchange B:	$\neg(\exists x (P(x)))$	$\equiv$	$\forall x (\neg P(x))$

Instantiation and Generalization

Universal Instantiation:	From $\forall x (P(x))$,	infer $P(c/x)$
Universal Generalization:	From $P(c/x)$,	infer $\forall x (P(x))$
Existential Instantiation:	From $\exists x (P(x))$,	infer $P(c^*/x)$
Existential Generalization:	From $P(c/x)$,	infer $\exists x (P(x))$