Set Theory

$a \in A$	a is an element of set A
$a \notin A$	a is not an element of set A
$\{a_1,a_2,\ldots,a_n\}$	Set with elements a_1 ... a_n
$\{x \in D \mid P(x)\}$	The set of all x in D for which P(x) is true
R	All real numbers
Z	All integer numbers
Q	All rational numbers
W	Whole numbers (counting numbers plus zero)
N	Natural numbers (counting numbers 1,2,3,4,5...)
$A \subseteq B$	A is a subset of B
$A \nsubseteq B$	A is NOT a subset of B
$A = B$	A equals B
$A \cup B$	A union B
$A \cap B$	A intersects B
B-A	Elements in B but not in A
A^c or $\overline{A}$	Complement of A
(x,y)	Ordered pair
A x B	Cartesian product
$\emptyset$, { }	Empty set
$\wp$ (A)	Power set of A

Logical Equivalences

t = tautology	$\sim$ = NOT	$\wedge$ = AND
c = contradiction	$\vee$ = OR	$\equiv$ = logically equivalent

Name	Form 1	Form 2
Commutative Laws	$p{\sim} \equiv q \vee p$	$p \vee q \equiv q \vee p$
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	$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$	$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$
Identity Laws	$p \wedge t \equiv p$	$p \vee c \equiv p$
Negation Laws	$p \vee {\sim} p \equiv t$	$p \wedge {\sim} p \equiv c$
Double Negation Laws	${\sim}{\sim} p \equiv p$	–
Idempotent	$p \wedge p \equiv p$	$p \vee p \equiv p$
Universal Bounds	$p \vee t \equiv t$	$p \wedge c \equiv c$
De Morgan's Laws	${\sim}(p \wedge q) \equiv {\sim} p \vee {\sim} q$	${\sim}(p \vee q) \equiv {\sim} p \wedge {\sim} q$
Absorption Laws	$p \vee (p \wedge q) \equiv p$	$p \wedge (p \vee q) \equiv p$
Negations of t and c	${\sim} t = c$	${\sim} c = t$

Rules of Inference with Propositions

p $p \rightarrow q$ $\therefore q$	*Modus ponens*
$\neg q$ $p \rightarrow q$ $\therefore \neg p$	*Modus tollens*
a) p $p \vee q$ b) q $\therefore p \vee q$	Addition/generalization
a) $p \vee q$ $\therefore p$ b) $p \wedge q$ $\therefore q$	Simplification/specialization
p q $\therefore p \wedge q$	Conjunction
$p \rightarrow q$ $q \rightarrow r$ $\therefore p \rightarrow r$	Hypothetical syllogism/transitivity
a) $p \vee q$ $\neg q$ $\therefore p$ b) $p \vee q$ $\neg p$ $\therefore q$	Disjunctive syllogism/elimination
$p \vee q$ $\neg p \vee r$ $\therefore q \vee r$	Resolution
$p \vee q$ $p \rightarrow r$ $q \rightarrow p$ $\therefore r$	Proof by division into cases