Topic 3: Propositions

Ch1.1 Propositinal Logic

- The rules of logic are used to distinuish between valid and invalid mathematical arguments.
- A **proposition** is a sentence that declares a fact, that is either true or false, but not both.

TABLE 1 The Truth Table for the Negation of a Proposition.

p	$\neg p$
T	F
F	T

TABLE 2 The Truth Table for the Conjunction of Two Propositions.

p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

TABLE 3 The Truth Table for the Disjunction of Two Propositions.

p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

TABLE 4 The Truth Table for the Exclusive Or of Two Propositions.

p	q	$p \oplus q$
T	T	F
T	F	T
F	T	T
F	F	F

TABLE 5 The Truth Table for the Conditional Statement $p \rightarrow q$.

p	q	$p \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

TABLE 6 The Truth Table for the Biconditional $p \leftrightarrow q$.

p	q	$p \leftrightarrow q$
T	T	T
T	F	F
F	T	F
F	F	T

TABLE 8 Precedence of Logical Operators.

Operator	*Precedence*
$\neg$	1
$\wedge$	2
$\vee$	3
$\rightarrow$	4
$\leftrightarrow$	5

- $p \rightarrow q$: "if p, then q." "if p, q." "q if p" "q when p" "p implies q" "p only if q"
- $p \leftrightarrow q$: "p *iff* q." $\equiv (p \rightarrow q) \wedge (q \rightarrow p)$

$p \rightarrow q$ origin $= \neg q \rightarrow \neg p$ contrapositive

$q \rightarrow p$ converse $= \neg p \rightarrow \neg q$ inverse

Appendix C-1: Logical Equivalence table; C-2: Logical Equivalence Conditional Statements; C-3: Logical Equivalence Biconditional Statements.