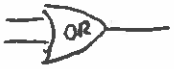
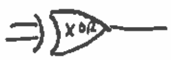
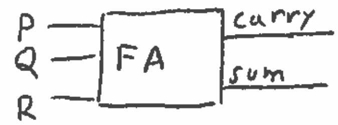
	GATE	TABLE	NEGATION SIMPLIFIED
$P \wedge Q$		see below	$\sim(P \wedge Q) = \sim P \vee \sim Q$
$P \vee Q$			$\sim(P \vee Q) = \sim P \wedge \sim Q$

P	Q	$P \wedge Q$
T	T	T
T	F	F
F	T	F
F	F	F

P XOR Q 

$\sim P$ 

(2's place)
(1's place)



(2's place)
(1's place)

$P \Rightarrow Q$

P	Q	$P \Rightarrow Q$
T	T	T
T	F	F
F	T	T
F	F	T

True $\Rightarrow$ False is F

$\sim(P \Rightarrow Q) = P \wedge \sim Q$

original implication $P \Rightarrow Q$

- P implies Q
- if P then Q
- Q, if P
- P only if Q
- P is sufficient for Q
- Q is necessary for P

biconditional $P \Leftrightarrow Q$

$= P \Rightarrow Q \wedge Q \Rightarrow P$

$=$ P if and only if Q

$=$ P necessary and sufficient for Q

converse $Q \Rightarrow P$

contrapositive $\sim Q \Rightarrow \sim P$

inverse $\sim P \Rightarrow \sim Q$

negation $P \wedge \sim Q$

- tautology : all T
- contradiction : all F
- valid / invalid argument } when premises T then conclusion T

$\forall$ P, Q. = for all P, Q. $\quad \sim(\forall P, Q) = \exists P$ s.t. $\sim Q$.

$\exists$ P s.t. Q. = there exists P s.t. Q. $\quad \sim(\exists P$ s.t. $Q) = \forall P, \sim Q$.

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