Theorem 2.1.1 Logical Equivalences

Ken

① commutativity

$p \vee q \equiv q \vee p$

$p \wedge q \equiv q \wedge p$

② associativity

$(p \vee q) \vee r \equiv p \vee (q \vee r)$

$(p \wedge q) \wedge r \equiv p \wedge (q \wedge r)$

③ distributivity

$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$

$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$

④ identity

$p \wedge T \equiv p$

$p \vee \bot \equiv p$

⑤ negation laws

$p \vee \neg p \equiv T$ (tautology)

$p \wedge \neg p \equiv \bot$ (contradiction)

⑥ negation elimination (double negative law)

$\neg(\neg p) \equiv p$

⑦ idempotence

$p \vee p \equiv p$

$p \wedge p \equiv p$

⑧ universal bound

$p \vee T \equiv T$

$p \wedge \bot \equiv \bot$

⑨ DeMorgan's laws

$\neg(p \vee q) \equiv \neg p \wedge \neg q$

$\neg(p \wedge q) \equiv \neg p \vee \neg q$

⑩ absorption

$p \vee (p \wedge q) \equiv p$

$p \wedge (p \vee q) \equiv p$

⑪ tautology & contradiction negation

$\neg T \equiv \bot$

$\neg \bot \equiv T$