

Laws of Algebra of Propositions

Identity:

$$p \vee p \equiv p$$

$$p \wedge p \equiv p$$

$$p \rightarrow p \equiv T$$

$$p \leftrightarrow p \equiv T$$

$$p \vee T \equiv T$$

$$p \wedge T \equiv p$$

$$p \rightarrow T \equiv T$$

$$p \leftrightarrow T \equiv p$$

$$p \vee F \equiv p$$

$$p \wedge F \equiv F$$

$$p \rightarrow F \equiv \sim p$$

$$p \leftrightarrow F \equiv \sim p$$

$$T \rightarrow p \equiv p$$

$$F \rightarrow p \equiv T$$

Commutative:

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

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

$$p \rightarrow q \neq q \rightarrow p$$

$$p \leftrightarrow q \equiv q \leftrightarrow p$$

Complement:

$$p \vee \sim p \equiv T$$

$$p \wedge \sim p \equiv F$$

$$p \rightarrow \sim p \equiv \sim p$$

$$p \leftrightarrow \sim p \equiv F$$

$$\sim p \rightarrow p \equiv p$$

Double Negation:

$$\sim(\sim p) \equiv p$$

Associative:

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

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

Distributive:

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

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

Absorbtion:

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

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

De Morgan's:

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

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

Equivalence of Contrapositive:

$$p \rightarrow q \equiv \sim q \rightarrow \sim p$$

Others:

$$p \rightarrow q \equiv \sim p \vee q$$

$$p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$$