Logical Equivalences

1. **Associative laws**

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

2. **Commutative laws**

   $p \vee q \equiv q \vee p$ $\qquad\qquad$ $p \wedge q \equiv q \wedge p$

3. **Distributive laws**

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

4. **De Morgan's laws**

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

5. **Idempotent laws**

   $p \vee p \equiv p$ $\qquad\qquad$ $p \wedge p \equiv p$

6. **Identity laws**

   $p \vee \mathbf{F} \equiv p$ $\qquad\qquad$ $p \wedge \mathbf{T} \equiv p$

7. **Domination laws**

   $p \vee \mathbf{T} \equiv \mathbf{T}$ $\qquad\qquad$ $p \wedge \mathbf{F} \equiv \mathbf{F}$

8. **Absorption laws**

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

9. **Double Negation law**

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

10. **Negation laws**

    $p \vee \neg p \equiv \mathbf{T}$ $\qquad\qquad$ $p \wedge \neg p \equiv \mathbf{F}$

11. **Equivalence of Implication**

    $$p \rightarrow q \equiv \neg p \vee q$$