

**Verify the following logical equivalences:**

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

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

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

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

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

6.  $(p \wedge \sim q) \wedge (\sim p \vee q) \equiv c$

7\*.  $(p \wedge q) \vee [\sim p \vee (p \wedge \sim q)] \equiv t$

8\*\*.  $[(\sim p \vee q) \wedge (p \vee \sim r)] \wedge (\sim p \vee \sim q) \equiv \sim (p \vee r)$

9\*\*.  $(r \vee p) \wedge [(\sim r \vee (p \wedge q)) \wedge (r \vee q)] \equiv p \wedge q$

10\*\*.  $\sim [(\sim p \wedge q) \vee (\sim p \wedge \sim q)] \vee (p \wedge q) \equiv p.$