

Useful Tautologies

You need not memorize these, but you should study them to see what they are saying. The letter C is used to represent a statement which is always FALSE. Such a statement is called a **contradiction**.

1. $(p \iff q) \iff [(p \implies q) \wedge (q \implies p)]$
2. $(p \iff q) \iff [(p \implies q) \wedge (\sim p \implies \sim q)]$
3. $(p \implies q) \iff (\sim q \implies \sim p)$
4. $p \vee \sim p$
5. $(p \wedge \sim p) \iff C$
6. $(\sim p \implies C) \iff p$
7. $[(p \wedge \sim q) \implies C] \iff (p \implies q)$
8. $[p \wedge (p \implies q)] \implies q$
9. $[\sim q \wedge (p \implies q)] \implies \sim p$
10. $[\sim p \wedge (p \vee q)] \implies q$
11. $p \wedge q \implies p$
12. $[(p \implies q) \wedge (q \implies r)] \implies (p \implies r)$
13. $[(p_1 \implies p_2) \wedge (p_2 \implies p_3) \wedge \dots \wedge (p_{n-1} \implies p_n)] \implies (p_1 \implies p_n)$
14. $[(p \wedge q) \implies r] \iff [p \implies (q \implies r)]$
15. $[(p \implies q) \wedge (r \implies s) \wedge (p \vee r)] \implies (q \vee s)$
16. $[p \implies (q \vee r)] \iff [(p \wedge \sim q) \implies r]$
17. $[(p \implies r) \wedge (q \implies r)] \iff [(p \vee q) \implies r]$