

List of Tautologies

In the following table, **t** means any tautology (a composite proposition which is always true irregardless of the combination of truth values of the original propositions) and **c** means any contradiction (a proposition which is always false irregardless of the combination of truth values of the original propositions).

Note that 4. - 16. are logical equivalences while 17. - 25. are logical implications.

Number	Tautology	Name
1.	$p \vee \neg p$	
2.	$\neg(p \wedge \neg p)$	
3.	$p \rightarrow p$	
4a.	$p \leftrightarrow (p \vee p)$	idempotent laws
4b.	$p \leftrightarrow (p \wedge p)$	
5.	$\neg\neg p \leftrightarrow p$	double negation
6a.	$(p \vee q) \leftrightarrow (q \vee p)$	commutative laws
6b.	$(p \wedge q) \leftrightarrow (q \wedge p)$	
6c.	$(p \leftrightarrow q) \leftrightarrow (q \leftrightarrow p)$	
7a.	$(p \vee (q \vee r)) \leftrightarrow ((p \vee q) \vee r)$	associative laws
7b.	$(p \wedge (q \wedge r)) \leftrightarrow ((p \wedge q) \wedge r)$	
8a.	$(p \wedge (q \vee r)) \leftrightarrow ((p \wedge q) \vee (p \wedge r))$	distributive laws
8b.	$(p \vee (q \wedge r)) \leftrightarrow ((p \vee q) \wedge (p \vee r))$	
9a.	$(p \vee \mathbf{c}) \leftrightarrow p$	identity laws
9b.	$(p \wedge \mathbf{c}) \leftrightarrow \mathbf{c}$	
9c.	$(p \vee \mathbf{t}) \leftrightarrow \mathbf{t}$	
9d.	$(p \wedge \mathbf{t}) \leftrightarrow p$	
10a.	$\neg(p \wedge q) \leftrightarrow (\neg p \vee \neg q)$	De Morgan's Laws
10b.	$\neg(p \vee q) \leftrightarrow (\neg p \wedge \neg q)$	
11a.	$(p \leftrightarrow q) \leftrightarrow ((p \rightarrow q) \wedge (q \rightarrow p))$	equivalence
11b.	$(p \leftrightarrow q) \leftrightarrow ((p \wedge q) \vee (\neg p \wedge \neg q))$	
11c.	$(p \leftrightarrow q) \leftrightarrow (\neg p \leftrightarrow \neg q)$	
12a.	$(p \rightarrow q) \leftrightarrow (\neg p \vee q)$	implication
12b.	$\neg(p \rightarrow q) \leftrightarrow (p \wedge \neg q)$	
13.	$(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$	contrapositive
14.	$(p \rightarrow q) \leftrightarrow ((p \wedge \neg q) \rightarrow \mathbf{c})$	reductio ad absurdum
15a.	$((p \rightarrow r) \wedge (q \rightarrow r)) \leftrightarrow ((p \vee q) \rightarrow r)$	
15b.	$((p \rightarrow q) \wedge (p \rightarrow r)) \leftrightarrow (p \rightarrow (q \wedge r))$	
16.	$((p \wedge q) \rightarrow r) \leftrightarrow (p \rightarrow (q \rightarrow r))$	exportation law
17.	$p \rightarrow (p \vee q)$	addition
18.	$(p \wedge q) \rightarrow p$	simplification
19.	$(p \wedge (p \rightarrow q)) \rightarrow q$	modus ponens
20.	$((p \rightarrow q) \wedge \neg q) \rightarrow \neg p$	modus tollens
21.	$((p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow (p \rightarrow r)$	hypothetical syllogism
22.	$((p \vee q) \wedge \neg p) \rightarrow q$	disjunctive syllogism
23.	$(p \rightarrow \mathbf{c}) \rightarrow \neg p$	absurdity
24.	$((p \rightarrow q) \wedge (r \rightarrow s)) \rightarrow ((p \vee r) \rightarrow (q \vee s))$	
25.	$(p \rightarrow q) \rightarrow ((p \vee r) \rightarrow (q \vee r))$	