Topic 1: Tautologies

A **tautology** is a statement which is always true.

Example 1: Determine whether $p \vee \sim p$ is a tautology.

p	$\sim p$	$p \vee \sim p$
T		
F		

Example 2: Construct a truth table for $\sim (p \vee r) \vee (p \vee q)$ and state whether it is a tautology.

p	q	r	$p \vee r$	$\sim (p \vee r)$	$p \vee q$	$\sim (p \vee r) \vee (p \vee q)$
T	T	T				
T	T	F				
T	F	T				
T	F	F				
F	T	T				
F	T	F				
F	F	T				
F	F	F				

Example 3: Construct a truth table for each of the following and state whether it is a tautology.

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

(b) $(\sim p \vee \sim q) \vee (\sim r \vee \sim p)$

(c) $\sim [(\sim p \wedge q) \vee r]$

(d) $(p \rightarrow q) \vee (q \rightarrow p)$