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# Topic 1: Tautologies

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- **Tautology:** 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)  $(p \rightarrow q) \vee (q \rightarrow p)$