University of Washington
Department of Computer Science and Engineering
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CSE 311, Autumn 2012

Class example, September 28, 2012

The following example was covered very quickly at the end of the morning lecture. Here is a more complete solution.

Problem :

Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology by applying a series of equivalences to derive T.

Solution:

$$
\begin{aligned}
(p \wedge q) \rightarrow (p \vee q) &\equiv \neg(p \wedge q) \vee (p \vee q) && \text{Law of Implication} \\
&\equiv (\neg p \vee \neg q) \vee (p \vee q) && \text{DeMorgan's Law} \\
&\equiv ((\neg p \vee \neg q) \vee p) \vee q && \text{Associative Law} \\
&\equiv (p \vee (\neg p \vee \neg q)) \vee q && \text{Commutative Law} \\
&\equiv ((p \vee \neg p) \vee \neg q)) \vee q && \text{Associative Law} \\
&\equiv (T \vee \neg q)) \vee q && \text{Negation Law for } \vee \\
&\equiv T \vee q && \text{Domination Law for } \vee \\
&\equiv T && \text{Domination Law for } \vee
\end{aligned}
$$