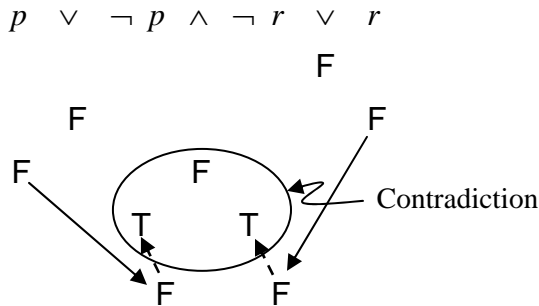


**COMP 681 Formal Methods Spring 2009 Recitation 2—Solutions**

Use the shorter truth table method to determine whether the following are tautologies.

1.  $p \vee \neg p \wedge \neg r \vee r$

**Answer**



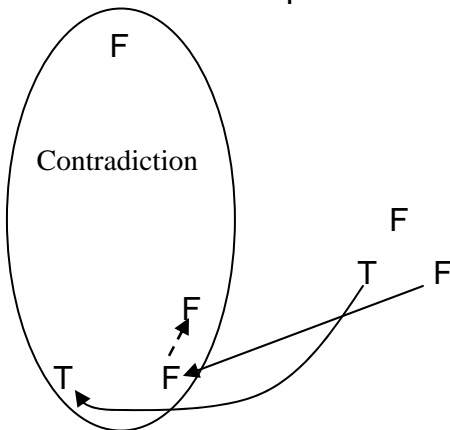
Since we reached a contradiction assuming the wff is F, it must always be T, i.e., it is a tautology.

2.  $p \Rightarrow q \wedge r \Rightarrow (p \Rightarrow q) \wedge (p \Rightarrow r)$

**Answer**

$p \Rightarrow q \wedge r \Rightarrow (p \Rightarrow q) \wedge (p \Rightarrow r)$

F

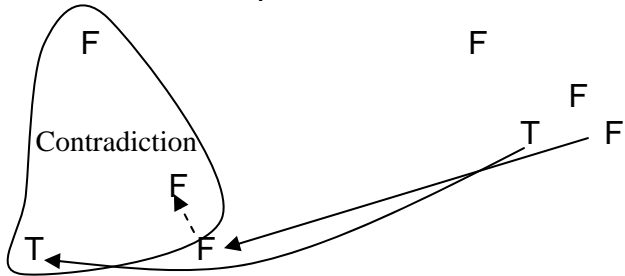


F There are 2 ways for the antecedent to be F and 2 ways for the consequent to be F. Consider the choices for the consequent: either conjunct can be F. First choice:  $p \Rightarrow q$  is F

This choice thus results in a contradiction. We now try the remaining choice, i.e., the case where the second conjunct in the consequent is F. We repeat the above down to the point where the choice is made..

$p \Rightarrow q \wedge r \Rightarrow (p \Rightarrow q) \wedge (p \Rightarrow r)$

F



This is the 2<sup>nd</sup> choice for a conjunct in the consequent being F.

We've now reached contradictions for both possible ways for the top-level consequent to be F. So, if we assume the wff to be F, we must reach a contradiction, so it must always be T, i.e., it is a tautology.