

CSCI 2824 Discrete Structures  
 Instructor: Hoenigman  
 Solutions for Assignment 2

1. Question 1 – Chris and his hobbies

$$\begin{aligned}
 & p \wedge \neg s \\
 & (r \wedge p) \vee s \\
 & \neg p \wedge (s \vee r) \\
 & (\neg p \wedge s \wedge r) \vee (p \wedge \neg s \wedge r) \vee (p \wedge s \wedge \neg r)
 \end{aligned}$$

2. Truth tables

These are logically equivalent since all rows in the truth table are the same.

$p$	$q$	$(p \vee q) \wedge (\neg p \vee q)$
T	T	T
T	F	F
F	T	T
F	F	F

These two are not logically equivalent because not all rows match

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

3. Sharks and the New Jersey Shore

Sharks have not been spotted at near the shore

If sharks have not been spotted, then swimming is allowed

If swimming is not allowed, then sharks have not been spotted near the shore

Swimming is not allowed, and either swimming is allowed or sharks have not been spotted near the shore.

4. There are four suspects in the crime, but only one can be guilty. You also know that only one person is telling the truth, so in putting together the truth table, you only need to consider the cases where exactly one person is telling the truth and everyone else is lying.

Alice	Carlos	John	Diana
T	F	F	F
F	T	F	F
F	F	T	F
F	F	F	T

In working through each scenario, you're looking for the scenario where there are no contradictions in what the suspects say with the requirement that only one person is guilty. For example, if Alice is telling the truth, then Carlos did it. However, John is lying when he said that he didn't do it, so if Alice is telling the truth, then two people are guilty, which is not the case we're looking for. The only possible scenario is where Diana is telling the truth and the result is that John is guilty.

5. Using the `parentOf` and `siblingOf` predicates:

*parentOf(John, Jeb)  $\wedge$  parentOf(Mary, Jeb)*  
*siblingOf(Lily, Mortimer)*  
*siblingOf(John, Joe)  $\vee$  parentOf(John, Joe)*