Homework 2

Andy Alvarenga

April 7, 2019

1. P is a Knight and Q is a Knave.
   There are four potential cases:

   (a) P =knight and Q =knight
   (b) P =knave and Q =knight
   (c) P =knight and Q =knave
   (d) P =knave and Q =knave

   Case 1 is impossible beacuse if P is a knight then Q must be a knave.
   In cases 2 and 4, if P is a knave, then what he says is untrue, therefore they are impossible.
   This leaves only case 3, which is the only possible combination because if P is a knight then
   Q must be a knave since knights do not lie.

2. A is Knave and B is a Knight.
   There are four potential cases:

   (a) A =knight and B =knight
   (b) A =knave and B =knight
   (c) A =knight and B =knave
   (d) A =knace and B =knave

   Case 1 and 3 are impossible because if A is a knight, then whatever he says is true.
   Case 4 is impossible because if B is a knave, he always lies.
   Therefore, case 2 is the only possible combination. If A is knave then B must be a knight.

1   Logical Identities

1. $\neg(p \rightarrow (q \rightarrow p))$
   $= \neg p \rightarrow \neg(q \rightarrow p)$
   $= \neg p \rightarrow (\neg q \rightarrow \neg p)$

2. $\neg((p \land q) \to (q \lor p))$
   $= \neg(p \land q) \to \neg(q \lor p)$
   $= (\neg p \lor \neg q) \to (\neg q \land \neg p)$

2 Logical Equivilances

1.

p	q	r	$p \to (q \to r)$	$(p \land q) \to r$	$(p \to (q \to r)) \leftrightarrow ((p \land q) \to r)$
0	0	0	1	1	1
0	0	1	1	1	1
0	1	0	1	1	1
0	1	1	1	1	1
1	0	0	1	1	1
1	0	1	1	1	1
1	1	0	0	0	1
1	1	1	1	1	1

The propositional statements are equivilant beacause the final column of the truth table recieves a value of one for all cases, meaning $(p \to (q \to r)) \leftrightarrow ((p \land q) \to r)$ is always true. Therefore, the pair is equivilant.

2.

p	q	r	$p \to (q \to r)$	$(p \to q) \to r$	$(p \to (q \to r)) \leftrightarrow ((p \to q) \to r)$
0	0	0	1	0	0
0	0	1	1	1	1
0	1	0	1	0	0
0	1	1	1	1	1
1	0	0	1	1	1
1	0	1	1	1	1
1	1	0	0	0	1
1	1	1	1	1	1

The propositional statements are not equivilant beacause the final column of the truth table, $(p \to (q \to r)) \leftrightarrow ((p \to q) \to r)$, does not recieve a value of one for all cases.

3 Logical Consequence

1. This is a valid argument because we have no way of knowing if the conclusion is false or not.

2. This is a valid argument since Puerto Rico is surrounded by water and since all islands are surrounded by water, then Puerto Rico must be an island.

4 Collaboration

Alberc Ej Salcedo and Spencer Tang