In The Name Of God, The Compassionate, The Merciful

Shiraz University

Homework1
Deadline: 12/7/98

1. Construct a truth table for each of the following compound statements, where p, q, r denote primitive statements.

   a) $[p \wedge (p \rightarrow q)] \rightarrow q$
   a) $q \Leftrightarrow (\neg p \vee \neg q)$
   b) $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

2. Determine whether or not the following compound statements are tautology. (without using truth table).
   a) $[p \rightarrow (q \rightarrow r)] \rightarrow [(p \rightarrow q) \wedge (p \rightarrow r)]$
   b) $p \rightarrow [q \rightarrow (p \wedge q)]$
   c) $(p \vee q) \rightarrow [q \rightarrow (p \wedge q)]$

3. Negate each of the following and simplify the resulting statement.
   a) $p \wedge (q \vee r) \wedge (\neg p \vee \neg q \vee r)$
   b) $p \rightarrow (\neg q \wedge r)$

4. Provide the steps and reasons to establish the following logical equivalences.
   a) $p \vee [p \wedge (p \vee q)] \Leftrightarrow p$
   b) $p \vee q \vee (\neg p \wedge \neg q \wedge r) \Leftrightarrow (p \vee q \vee r)$
   c) $[(\neg p \vee \neg q) \rightarrow (p \wedge q \wedge r)] \Leftrightarrow (p \wedge q)$

5. Show whether or not the following logical equivalences are valid.
   a) $\neg ((\neg p \wedge q) \vee (\neg p \wedge \neg q)) \vee (p \wedge q) \equiv p$
   b) $\neg (p \vee \neg q) \vee (\neg p \wedge \neg q) \equiv p$

Attention: The due date is as specified above, therefore, please try to finish your homework on time as the deadline might not extend. Feel free to ask your graders in case of encountering any problem. Do your best and leave us with the rest.