

CSci 243 Homework 1

My name

1. (4 points each) Construct a truth table for each of these compound propositions.
 - (a) $(p \wedge q) \rightarrow (p \vee q)$
 - (b) $((p \rightarrow q) \rightarrow r) \rightarrow s$
 - (c) $(p \leftrightarrow q) \oplus (p \leftrightarrow \neg q)$

2. (4 points each) Using logical identities and laws, show the logic equivalence of
 - (a) $p \leftrightarrow q$ and $(p \wedge q) \vee (\neg p \wedge \neg q)$
 - (b) $p \leftrightarrow q$ and $\neg p \leftrightarrow \neg q$
 - (c) $(p \rightarrow r) \vee (q \rightarrow r)$ and $(p \wedge q) \rightarrow r$

3. (4 points each) Recall the logic puzzle – the island of knights and liars (knights only tell the truth, while liars always lie) – we discussed in class. You encounter two people, A and B. Determine, if possible, what A and B are according to what they said. When there is no unique solution, list all possible solutions or state that there are no solutions. Explain your reasoning.
 - (a) A says "At least one of us is a liar" and B says nothing.
 - (b) A says "I am a liar or B is a knight" and B says nothing.
 - (c) Both A and B say "I am a knight."
 - (d) Both A and B say "I am a liar."

4. (**Bonus Question** 2 point¹) We want to determine the relative salaries of three coworkers – A, B, C – using two facts. First, we know that if A is not the highest paid of the three, then B is. Second we know that if B is not the lowest paid, then C is paid the most. Who is paid the most and who the least? Explain your reasoning.

¹The points for bonus questions are added directly to the final grade.