1. Construct a truth table for each of the following compound propositions

   a) \((p \lor q) \land r\)

   b) \((p \land q) \land r\)

   c) \((p \land q) \lor \neg r\)

On the following questions, you must construct a truth table to show your conclusions. This should be done by constructing compound propositions based on the statements (i.e., similar to the truth table puzzle in the notes). Then show that only one row of the truth table gives the correct result under the information given.

2. Five friends have access to a chat room. Is it possible to determine who is chatting if the following information is known? Either Kevin or Heather, or both, are chatting. Either Randy or Vijay, but not both, are chatting. If Abby is chatting, so is Randy. Vijay and Kevin are either both chatting or neither is. If Heather is chatting, then so are Abby and Kevin. Explain your reasoning.

3. Four friends have been identified as suspects for an unauthorized access into a computer system. They have made statements to the investigating authorities. Alice said “Carlos did it.” John said “I did not do it.” Carlos said “Diana did it.” Diana said “Carlos lied when he said I did it.”
   a. If the authorities also know that exactly one of the four suspects is telling the truth, who did it? Explain your answer.
   b. If the authorities also know that exactly one is lying, who did it? Explain your answer.