1) Use Truth Tables to verify the following. Be very complete in truth table set up. Justify the truth value of each individual part of the identities below.
   a) \( \neg (P \lor Q) \equiv \neg P \land \neg Q \)
   b) \( P \lor (Q \land \neg P) \equiv P \lor \neg Q \)

2) Given the following statements:
   P: Jane graduates in May
   Q: Grant is not a Freshman

   A) The statement P is false and the statement Q is true. Express each of the following compound sentences in symbolic logic and determine the truth value of the sentence.
      1) Jane graduates in August and Grant is not a freshman.
      2) Either Grant is a sophomore or Jane graduates in May.

   B) Determine the truth value of each of the following and then convert to English sentences.
      1) \( \neg (\neg P \land Q) \)
      2) \( P \oplus Q \)

3) The \textit{nand} operator denoted by “\textit{l}” is defined by \( P \text{ l} Q \iff \neg (P \land Q) \)
   Give the truth table for \( P \text{ l} Q \)

4) Which of the following statements is the Exclusive Or and which is the Inclusive Or?
   1) You may major in Mathematics or you may major in Engineering.
   2) You can go to the movies tonight or you can stay home.
   3) Tomorrow there will be rain or blue sky.
   4) In order to help clean the dorm room you can make the beds or clean off the desk.

Continued:
5) Logic Puzzle:

Instructions: You may solve this puzzle anyway you wish. Then you must write a paragraph that gives a clear description of your reasoning. Do not use a chart or refer to a chart in your final written explanation. Do your best. This is an exercise to help you understand how difficult it can be to explain reasoning. This course will help you develop the skills you need to be precise and clear.

The Polo Club:
Armand Alloway, Basil Bennington, Col. Carlton Cunningham, Durwood Dunstan, and Everett Elmsby, Esq. are five senior members of the Devonshire Polo Club. Each owns a pony that is named after the wife of one of the other senior members.
Mr. Alloway’s pony is named Georgette; Col. Cunningham owns Jasmine; and Mr. Elmsby owns Inez. Francine, owned by Mr. Dunstan is named after Alloway’s wife. Georgette’s husband owns the pony that is named after Mr. Bennington’s wife. Helene Cunningham is the only wife who knows how to ride a horse.
Match up the husbands with their wives.