1) Use Truth Tables to verify the following:
   a) \( \sim (p \land q) \equiv \sim p \lor \sim q \)
   b) \([ (p \lor q) \land (\sim p) ] \land q = \sim p \land q \)

2) Given the following statements:
   P: Max is a VT graduate
   Q: Joe is a Freshman

   A) The statement P is true and the statement Q is false. Express each of the following compound sentences in symbolic determine the final truth value.

   1) Joe is a freshman, but Max is not a VT graduate.
   2) Either Joe is not a freshman or Max is a VT graduate.
   3) It is not true that Max is a VT graduate or that Joe is not a freshman.

3) Use the algebra of logic to simplify and verify the following:

   \([ \sim (p \lor q) \lor \sim p ] \land (p \land (r \lor \sim r)) \equiv \sim p \)

4) The nand operator denoted by “I” is defined by \( P \mid Q \iff \sim (P \land Q) \)
   Give the truth table for \( P \mid Q \)

4) Determine which of the following statements is the Exclusive Or and which is the Inclusive Or.

   1) This restaurant’s dinners will include a soup or a salad for the listed price.
   2) To apply for this job you must have 3 years experience or a master’s degree.
   3) You may either play games or you may watch TV before bed.
   4) The Club needs for you to help out with membership or with program.
Car Pooling ---- A logic problem:
Instructions: You may solve this puzzle anyway you wish. Then you must write a clear description of the process that you used so that I can follow your reasoning. Do not use a table 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 throughout this semester.

THE CAR POOL:
Six business people travel to and from work in a car pool van driven by a seventh person. The six are picked up each workday morning from their home and returned to their home each evening. From the statements that follow, determine the first name (Milton, Paul, Neal, Gloria, Florence, Evelyn), the surname (Adams, Avenal, Amarol, Altchech, Atwater, Agassi), occupation (one is a computer programmer), sequence of pickup, and sequence of drop off for each of the six business car poolers. Due to traffic patterns, the evening drop-off sequence is not necessarily the reverse of the morning pick up sequence.

Statements: (One of the statements below is false.)
1) Amarol feels that she is fortunate to be the first one dropped off in the evening.
2) Neither Neal, Florence, Agassi, nor Atwater is the secretary.
3) Paul is the sixth to picked up in the morning, but Avenal is the first to be dropped off in the evening.
4) The word processing supervisor is the third to be dropped off in the evening; the secretary is the second to be picked up in the morning and the fifth to be dropped off in the evening.
5) Adams, the attorney, dislikes having to be the first to be picked up in the morning and the last to be dropped off in the evening.
6) Gloria is picked up in the morning immediately after Neal and immediately before Paul. In the evening she is dropped off immediately after Avenal and immediately before Amarol, who is dropped off immediately before Evelyn.
7) Avenal, who is not the systems analyst, and Amarol are members of the men’s choral group.
8) The personnel manager, who is not Atwater, is not the fourth or fifth to be picked up in the morning.