Math 2534 Homework 2 sec 2.1 – 2.3

Follow the Homework requirements. Put work on another sheet of paper.
Staple all multiple sheets.

Problem 1: Use Algebra of Logic to prove the following:

$[(p \to q) \wedge \sim p] \to [\sim (p \to q)] \equiv p$

Problem 2: Using algebra of logic put the following in Disjunctive Normal Form: You may fill in the blanks on this work sheet.

$(p \to q) \to [(p \wedge r) \to (q \wedge r)] \equiv$ _____Given_____

$\sim (\sim p \vee q) \vee [\sim (p \wedge r) \vee (q \wedge r)] \equiv$ _____

$(p \wedge \sim q) \vee [(\sim p \vee \sim r) \vee (q \wedge r)] \equiv$ _____

$(p \wedge \sim q) \vee (\sim p) \vee [(\sim r) \vee (q \wedge r)] \equiv$ _____

$(p \wedge \sim q) \vee (\sim p) \vee [(\sim r \vee q) \wedge (\sim r \vee r)] \equiv$ _____

$(p \wedge \sim q) \vee (\sim p) \vee [(\sim r \vee q) \wedge T] \equiv$ _____

$(p \wedge \sim q) \vee (\sim p) \vee (\sim r \vee q) \equiv$ _____

$(p \wedge \sim q) \vee (\sim p \wedge \sim p) \vee (\sim r \wedge \sim r) \vee (q \wedge q)$ _____

Problem 3: Put the following into symbolic **implication form**. Define all your variables.

a) I will clean up only if you help.
b) The game will be postponed if it is raining.
c) I will not go to the movie or I will not study.

Problem 4: If Anna goes to Roswell, New Mexico, she might see an alien space ship.

1) Rewrite the above sentence in converse form.
2) Rewrite the above sentence in contrapositive form.

Problem 5: Determine if the following arguments are valid and justify your conclusion. Put each argument into symbolic logic and define all variables. In justifying your conclusion be sure to indicate what is the sufficient condition and what is the necessary condition.

a) If you are in the Marching Virginians , then you must go to the game.
You went to the game.
Therefore you are in the Marching Virginians.

b) If the test is Thursday, you will miss the game.
You did not miss the game.
Therefore you did not have a test.

Problem 6: P,Q and R represent the following statements:

P: Jim is a CS Major
Q Anne is an EE Major
R Laura is an Environmental Science Major
M Charlie is a Math Major

Assume that the expression $(P \vee \sim R) \rightarrow (Q \wedge M)$ is false and that R is true and M is true.

Put the following statements into implication form and determine if the sufficient and necessary conditions are true or false and if the implication is true or false.

a) Anne is a EE Major or Charlie is not a Math Major.

b) Jim is a CS Major and Anne is not an EE Major.

c) Only if Anne is a EE Major is Jim a CS Major

Problem 7: **A Logic Puzzle and Working with Hypothesis**

For your solution to the logic puzzle below, you need to put all statements into symbolic logic and define your variables. Then write a concise **paragraph** that **justifies** your reasoning and your conclusion. Indicate clearly the sufficient and necessary conditions. **Summarize your conclusions.**

Report Card

Three siblings Alice, Bob and Carol truthfully reported their grades to their parents as follows:

Alice: If I passed math, then so did Bob.
I passed English if and only if Carol did.

Bob: I passed math only if Alice did.
Alice did not pass History.

Carol: Either Alice passed history or I did not pass it.
If Bob did not pass English, then neither did Alice.

If each of the three passed at least one subject and each subject was passed by at least one of the three, and if Carol did not pass the same number of subjects as either of her siblings, which subjects did they each pass?

Define your variables as follows so that we all have the same notation:

A_E means that Alice passed English
A_M means that Alice passed Math
A_H means that Alice passed History
B_E means that Bob passed English
B_M means that Bob passed Math
B_H means that Bob passed History
C_E means that Carol passed English
C_M means that Carol passed Math
C_H means that Carol passed History