Propositional Logic Tutorial

Problem 1:

Translate the following sentences into propositional logic: Dịch các câu sang logic mệnh đề:

1. If John and Marry are not in town, we will play tennis.
2. I will pass or fail this course.
3. You will not pass this course unless you study.

You will need to identify a scheme of abbreviation and logical connectives.

Problem 2:

How many models are there for the following sentences:

a. $(A \wedge B) \vee (B \wedge C)$
b. $A \vee B$
c. $A \Leftrightarrow B \Leftrightarrow C$

Câu 3:

Convert the following sentences into conjunctive normal form (CNF):

1. $P \Rightarrow Q$
2. $(P \Rightarrow \neg Q) \Rightarrow R$
3. $\neg (P \wedge \neg Q) \Rightarrow (\neg R \vee \neg Q)$

Problem 4:

Using the truth table method, show that the following inferences are valid:

$P \rightarrow Q, \neg Q \models \neg P$
$P \rightarrow Q \models \neg Q \rightarrow \neg P$

Problem 5:

Repeat the previous problem using resolution.

Problem 6:

Using the truth table method, determine whether the following sentences are valid or satisfiable:

$((P \vee Q) \wedge \neg P) \rightarrow Q$

$((P \rightarrow Q) \wedge \neg(P \rightarrow R)) \rightarrow (P \rightarrow Q)$

$\neg(\neg P \wedge P) \wedge P$

Problem 7:

Repeat the previous problem using resolution.

Problem 8:

Given the following, can you prove that the unicorn is mythical? How about magical? Horned?

If a unicorn is mythical, then it is immortal, but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical, if it is horned.