CIS 630 assignment #5

Due: November 7, at class meeting.

Problem 1. Converting the following wffs into CNF. Express your results for each wff by a set of clauses. You should write the intermediate steps of the transforms, instead of giving me the final answer. (25')

1. $\neg[((P \vee \neg Q) \supset R) \supset (P \wedge R)]$.
2. $[\neg(A \supset \neg B)] \vee (B \wedge \neg C) \vee \neg(C \wedge D)$.
3. $(A \wedge \neg B) \equiv \neg C$.

Problem 2. For each of the above wffs, answer the following questions. (We assume the atoms appear in a wff are all the atoms in the language.) (25')

1. How many interpretations does each wff have? Of which how many interpretations are models for each wff above?
2. What are the models for each wff above?

Problem 3. Given a set of wffs expressed as clauses:

$$\Delta = \{A \cup \neg B \cup C, B \cup D, \neg D \cup C, \neg A \cup D\}$$

What are the models for Δ? Does Δ logically entail C? i.e. $\Delta \models C$? If yes, try to prove $\Delta \vdash_{\mathcal{R}} C$ using resolution refutation rule (show your proof by a tree). (25')

Problem 5. Express the following sentences by wffs in predicate calculus. We assume the domain of objects are people, including students at OSU. (25')

1. *All students who attend both classes cis630 and cis730 passed cis630.*
2. *Only one student failed both cis630 and cis680.*
3. *If Mary passed cis630 then any other students in cis630 passed cis630.*
4. *There is a barber who shaves all men who do not shave themselves.*