1	10	
2	20	
3	20	
4	20	
5	20	
Total	90	

Name ______________________________

Examination 1

CS 313H

1. The important issue is the logic you used to arrive at your answer.
2. Use extra paper to determine your solutions then neatly transcribe them onto these sheets.
3. Do not submit the scratch sheets. However, all of the logic necessary to obtain the solution should be on these sheets.
4. Comment on all logical flaws and omissions and enclose the **comments in boxes**

1. [10] Using a truth table prove that $(p \vee \sim(q \wedge r)) \Rightarrow (q \Rightarrow (r \Rightarrow p))$ is a tautology.

2. [20] Using the predicates defined on the set of people (for x and y) and the set of integers (for n):

Exy	x is equal to y,
Dxn	x will die within n months,
Px	x has the disease polyputrid,
Cxy	x is a child of y,

Express in the syntax of Predicate Calculus:

a. "Exactly one person who has polyputrid has a parent who has it."

b. "If at least two different people have polyputrid then everyone will die in two to four months."

c. "No one who has poluputric will die within the next year."

3. [15] Using sentential calculus (with a four column format), prove that the conclusion $\sim p \wedge \sim q$ follows from premises: $(p \Rightarrow r) \wedge (q \Rightarrow s), (s \wedge r) \Rightarrow t, \sim t$ and $p \wedge q$.

4. [15] Prove that the conclusion $\sim q \wedge p$ follows from the premises $(p \Rightarrow q) \Rightarrow r$ and $\sim r$. First convert the premise and the negation of the conclusion into Conjunctive Normal Form, and then employ a resolution proof to get a contradiction.

5. [20] Using sentential calculus (with a four column format), prove that the conclusion $\sim (\forall z)Rz$ follows from these premises: Pa, $Rc \Rightarrow \sim (Pa \wedge Qb)$, $((\exists y)Py) \Rightarrow ((\forall x)Qx)$.