

1	10	
2	20	
3	15	
4	15	
5	20	
Total	80	

Examination 1

Name _____

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 real numbers:

$LTxy$ x is less than y ,

$EQxy$ x is equal to y ,

$SRxy$ x is a square root of y ,

Express in the syntax of Predicate Calculus:

a. "All real numbers x , y , and z satisfy if x is less than y and y is less than z then x is less than z ."

b. "For every pair of numbers x and y so that $x < y$, there is a z strictly between x and y ."

c. "For every pair of numbers x and y so that $x < y$, there is more than one number strictly between x and y ."

d. "Any positive number has at most one positive square root."

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

4. [15] Prove $(p \vee \sim q) \Rightarrow (p \vee q)$ follows from the premise $\sim q \Rightarrow p$ using resolution.

5. [20] Prove that $((\exists x)((\forall y)Rxy) \Rightarrow ((\forall u)((\exists v)Rvu))$ holds without premises.