

Name (PRINTED): _____

Student ID #: _____

Section # (or TA's: _____
name and time)

CMSC 250

Exam #1 ANSWERS

Thurs., Mar. 11, 2004

Write all answers legibly in the space provided. The number of points possible for each question is indicated in square brackets – the total number of points on the exam is 100, and you will have exactly 1 hour and 10 minutes to complete this exam. You may not use calculators, textbooks or any other aids during this exam. If you need more space for any answer, ask for an extra paper - these extra papers must be turned in and you must mark so we can find the answer corresponding to a question. The “cheatsheet” (which is the last page of the exam) can be ripped off and used during the exam, and the back of the cheat sheet can be used for scratch paper.

1. [15 pnts.] Use a COMPLETE truth table to determine if the following argument is valid or not. Use 1 for “true” and 0 for “false” to create the complete truth table. If it is not valid, indicate all rows/columns indicate that it is not valid; if it is valid, mark all rows/columns which prove that it is valid.

P1	$(A \rightarrow W) \vee \sim R$
P2	$\sim A \vee \sim W$
P3	$R \rightarrow A$
	Therefore $\sim (W \vee R)$

a	w	r	$a \rightarrow w$	$\sim a$	$\sim w$	$\sim r$	$(a \rightarrow w) \vee \sim r$	$\sim a \vee \sim w$	$r \rightarrow a$	$w \vee r$	$\sim (w \vee r)$
1	1	1	1	0	0	0	1	0	1	1	0
1	1	0	1	0	0	1	1	0	1	1	0
1	0	1	0	0	1	0	0	1	1	1	0
1	0	0	0	0	1	1	1	1	1	0	1
0	1	1	1	1	0	0	1	1	0	1	0
0	1	0	1	1	0	1	1	1	1	1	0
0	0	1	1	1	1	0	1	1	0	1	0
0	0	0	1	1	1	1	1	1	1	0	1

_____ NO _____ (Yes or No) These statements do represent a valid argument.

Explain why you selected this answer for validity/invalidity - indicate how specific rows/columns indicated this answer to you.

ANSWER: The sixth row is a “critical row because the 8th, 9th and 10th columns (which represent the 3 premises) are all true. This critical row, though, has a false conclusion as can be seen in the far right column of the 6th row.

**** This area is for grading purposes (points lost per page)- Do not write below this line ****

1	2	3	4	5	6	7	8	9	10	Total

2. [15 pnts.] Use only those rules given on the “cheatsheet” to prove that the following is a valid argument. It is a Valid Argument - you only need to prove that it is.

P1	$\forall x \in D, (\sim P(x) \wedge Q(x)) \rightarrow R(x)$
P2	$\exists x \in D, \sim P(x) \rightarrow M(x)$
P3	$\forall x \in D, \sim R(x) \vee Z(x)$
P4	$\forall x \in D, \sim Z(x) \rightarrow \sim P(x)$
	Therefore $\exists x \in D, Z(x) \vee (\sim Q(x) \wedge M(x))$

line	Statement	Reason	Line #s
1	$\sim P(a) \rightarrow M(a)$	\exists inst.	P2
2	$\sim Z(a)$	Assume	
3	$\sim P(a)$	\forall MP	2,P4
4	$M(a)$	MP	1,3
5	$\sim R(a) \vee Z(a)$	\forall inst.	P3
6	$\sim R(a)$	Disj. Syll	5,2
7	$\sim (\sim P(a) \wedge Q(a))$	\forall MT	P1,6
8	$P(a) \vee \sim Q(a)$	DeMorg and DN	7
9	$\sim Q(a)$	Disj Syll	8,3
10	$\sim Q(a) \wedge M(a)$	Conj. Add	4,9
11	$\sim Z(a) \rightarrow (\sim Q(a) \wedge M(a))$	CCW without contra	2-10
12	$Z(a) \vee (\sim Q(a) \wedge M(a))$	def of Implication	11
13	$\exists x \in D, Z(x) \vee (\sim Q(x) \wedge M(x))$	\exists gen.	12

3. [36 pnts.] For each of the following either give a complete proof to demonstrate that the statement is true or a counter-example with validation to show that it is false. For these problems you may use any of the formal definitions given in class or the textbook, and you may use the fact that “every integer is either even or odd but not both”.

a. For all integers (a,b,m,n) greater than 1, if $m|n$ and $a \equiv_m b$, then $a \equiv_n b$.

FALSE

COUNTER-EXAMPLE:

let $a = 3$ and $b = 5$ and $m = 2$ and $n = 4$

All of these values are integers that are greater than 1

It is true that $m|n$ since $2|4$

and it is true that $a \equiv_m b$ since $3 \equiv_2 5$ (because $2|(5 - 3)$ which is really $2|2$).

So the antecedent is true.

But the consequent is false with these values since

$a \not\equiv_n b$ since $3 \not\equiv_4 5$ (because $4 \nmid (5 - 3)$ which is really saying $4 \nmid 2$).