Answer Rey

Problem Set 4 PHIL 1068 Elementary Logic Due: 11 April 2011 by 4:00PM

Name	Chan
Student II	Number
Make sure your Do not submit a Late penalty: 10 This problem se Answer the quest If the grader can Be sure that all Check the cours Do your own wo	problem set to Ms. Loletta Li in Main Building 312. problem set is timestamped. assignments by email. % for each day late. t will not be accepted after 13 April. stions on the problem set itself. Write neatly. mot read your handwriting, you will not receive credit. pages of the assignment are securely stapled together. te bulletin board for announcements about the assignment. problem set, or permit others to copy, you may fail the course.
Circle '' Circle '' For this T T T T T F T F	ks) True or false? T' if the statement is true. F' if the statement is false. question, you should assume that φ and ψ are WFFs of MPL. " $\exists x(Gx \to Gy)$ " is a valid MPL WFF. If ψ is consistent, then ψ is not valid. "Richard Nixon said that" is a truth functional connective. If X is an inconsistent set of MPL WFFs, then some member of X is inconsistent. If X is a consistent set of MPL WFFs, then some member of X is consistent. If X is an inconsistent set of MPL WFFs, then every member of X is consistent. The following argument can be shown to be valid in SL: "Someone gets an A. If someone gets an A, then Nick gets an A. So, Nick gets an A." There is an interpretation under which " $\exists x(Fx\&Gx)$ " is false and " $\forall x(Hx \lor Gx)$ " is true. If φ entails ψ then ψ is consistent. " $\exists x(\sim Qx \to Px)$ " is a valid MPL WFF.

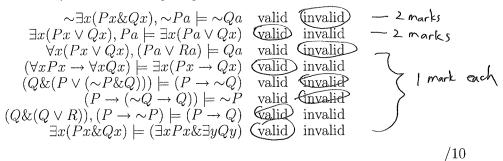
2. (10 marks)

For each of the following:

Circle "valid" if it is a valid sequent.

Circle "invalid" if it is an invalid sequent.

Otherwise, don't circle anything.



3. (15 marks)

Translate the following statements and arguments into MPL. Preserve as much structure as possible.
Use the following translation scheme:

a: Aaron

b: Bill

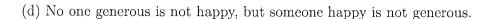
Hx: x is happy

Gx: x is generous

(a) If someone is generous, then not everyone is happy.

(b) No one is happy unless Bill is generous.

(c) If everyone is happy then Bill is not happy. No one is both generous and happy. But Aaron is not generous. So either every generous person is not happy or Aaron is happy.



(e) Bill and Aaron are both generous if exactly one of the two is happy.

Smarks each /15

4. (10 marks)

Give an MPL WFF that is logically equivalent to each of the following WFFs. Your answer must include an existential quantifier if the original WFF contains a universal quantifier, and vice versa.

(MPL WFF φ is logically equivalent to MPL WFF ψ if and only if φ entails ψ and ψ entails φ .)

(a) $\forall x (Fx \& Gx)$

(b) $\sim \exists x (Fx \vee Gx)$

5 marks each /10

5. (10 marks)

Is there an interpretation under which all the following MPL WFFs are true? If yes, then give one such interpretation. If not, explain why there is no such interpretation.

$$\exists x \sim (Ax\&(Bx\&Cx))$$

$$\forall x (Cx \leftrightarrow Bx)$$

$$\exists y (Ay\& \sim By)$$

$$\forall x (Ax \rightarrow (\sim Cx \vee Bx))$$

/10

6. (10 marks)

Is there a consistent MPL WFF which is false under every interpretation? If so, give such a WFF. If not, explain why there is no such WFF.

No

/10

7. (10 marks)

Give an interpretation under which " $\exists x (Px\&Qx)$ " is false and " $\forall x (Px \lor Qx)$ " is true.

Domain i wick

/10

8. (15 marks) For each of the following, if it is possible, show it using our MPL natural deduction system. If it is not possible, write "not derivable".

(a) $\forall x (Ax \rightarrow Bx) \vdash \sim \exists x (Ax \& \sim Bx)$

(a)	$\forall x(Ax \to Dx) \vdash \forall \exists x(Ax \otimes Dx)$		
1	1. Yx (Ax > Bx)	A	
y	1. Fix LAIL & ~ BX	A	
3	3. (Aa & NBa)	A	
1	4. (Aa > Ba)	14 E	
	s. Aa	3& E	
1.3	6. Ba	4.576	
1	7. ABa	3 & E	
1.3	8. (Ba & ~Ba)	6.7 L I	
1.3	9. ~ FIL (ARL NBIL)	1.8 NI	
1,2	10. ~ Fx CAK 2~ BK)	23976	
1.2	11. (Fix (Asid NBIL) & n 3,	(Ax & NR.)	2.10&I
1	12. NAX CAXANBRY	CII// DE)	
,	LA LAXANDRY		2,1127

4 marks

(b) $\vdash \forall x (\exists y A y \rightarrow A x)$

Not Derivable 4

3 matks

- (c) $\exists x (Ax \& Bx) \vdash (\exists x Ax \rightarrow \exists x Bx)$
 - 1 1, 3x (Ax &Bx)
 2, 7x Ax
 3 3, (Aa&Ba)
 4. Ba
 3 5, 3x Bx
 1 6. 3x Bx
 1 7. (3x Ax 7 3x Bx)
- 17 A A 3.26 431 113.5 36 2.6 7 I

4 marks

- (d) $(Ab \rightarrow \forall xBx) \vdash \forall x(Ab \rightarrow Bx)$
 - 1 1. (Ab > 1/2 B)() 2. Ab 1.2 3. b. b.c. 1.2 4. Bc 1 5. (Ab > BC) 1 6. V2 (Ab > BX)
- A 1,2 76 3. VE 2,4 71 tvI

4 Marks

/15

