

### Phi 270 F97 quiz 3 and part of quiz 4 (of 6)

(questions from these two tests addressed the part of the course your test is designed to cover)

Analyze the sentences below in as much detail as possible *without* going below the level of sentences (i.e., without recognizing individual terms and predicates). Be sure that the unanalyzed components of your answer are complete and independent sentences and that you respect any grouping in the English.

**3-1.** *The creek will be high enough only if it rains.*

[ answer ]

**3-2.** *Unless you object, Al will show the letter to Barb if she asks to see it.*

[ answer ]

Check each of the following for validity using the basic system of derivations (i.e., *do not use* attachment rules but *you may use* detachment rules). If a derivation fails, present a counterexample that divides its premises from its conclusion.

**3-3.**

$$A \rightarrow (B \vee C)$$

$$\neg C \rightarrow (A \rightarrow B)$$

[ answer ]

**3-4.**

$$A \rightarrow (B \rightarrow C)$$

$$(C \wedge A) \rightarrow B$$

[ answer ]

**3-5.** Analyze the sentence below in as much detail as possible, continuing the analysis when there are no more connectives by identifying predicates, functors, and individual terms. Be sure that the unanalyzed expressions in your answer are independent and that you respect any grouping in the English.

*If Dan's wife received the message, she is the person who called.*

[ answer ]

**3-6.** [This question was on a topic not covered in FO4]

**a.** Give two different expansions (using  $\lambda$ -notation for predicate abstracts) of the sentence: Raba.

[ answer ]

**b.** Put the following into reduced form:  $[\lambda x (Pxa \wedge Qbx)]a$ .

[ answer ]

**4-1.** Describe a structure (i.e., an assignment of extensions to the non-logical vocabulary) which makes the following sentences all true. (You may present the structure either using tables or, were possible, using diagrams.)

$$a = fb, fa = fb, b = c, Fa, \neg F(gc), Rb(fa), \neg Ra(fb), R(gc)c$$

[ answer ]

Use derivations to check each of the claims of entailment below. You need *not* present counterexamples to dead-end gaps.

**4-2.**  $Fa \wedge \neg Fb \Rightarrow b = c \rightarrow \neg a = c$

[ answer ]

**4-3.**  $fa = c, fb = c, Rc(fa) \rightarrow Ra(fa) \Rightarrow R(fa)(fb) \rightarrow Rb(fb)$

[ answer ]

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**Phi 270 F97 Answers to quiz 3 and part of quiz 4**

**3-1.** *the creek will be high enough only if it rains*  
 $\neg$  *the creek will be high enough*  $\leftarrow$   $\neg$  *it will rain*  
 $\neg H \leftarrow \neg R$  **or**  $\neg R \rightarrow \neg H$   
 if not R then not H

[H: *the creek will be high enough*; R: *it will rain*]

**3-2.**  $\neg$  *you will object*  $\rightarrow$  *Al will show the letter to Barb if she asks to see it*  
 $\neg$  *you will object*  $\rightarrow$  (*Al will show the letter to Barb*  $\leftarrow$  *Barb will ask to see the letter*)  
 $\neg O \rightarrow (S \leftarrow A)$  **or**  $\neg O \rightarrow (A \rightarrow S)$   
 if not O then if A then S

[A: *Barb will ask to see the letter*; O: *you will object*; S: *Al will show the letter to Barb*]

**3-3.**

	$A \rightarrow (B \vee C)$	3
	$\neg C$	(4)
	$A$	(3)
3 MPP	$B \vee C$	4
4 MTP	$B$	(5)
	•	
	$B$	2
5 QED		
	$A \rightarrow B$	1
2 CP		
1 CP	$\neg C \rightarrow (A \rightarrow B)$	

**3-4.**

	$A \rightarrow (B \rightarrow C)$	3
	$C \wedge A$	2
	$C$	
2 Ext	$A$	(3)
2 Ext	$B \rightarrow C$	5
3 MPP		
	$\neg B$	
	$\neg B$	
	○	$A, \neg B, C \Rightarrow \perp$
	$\perp$	6
6 IP	$B$	5
	$C$	
	○	$A, \neg B, C \Rightarrow \perp$
	$\perp$	5
5 RC	$\perp$	4
4 IP	$B$	1
1 CP	$(C \wedge A) \rightarrow B$	

A	B	C		$A \rightarrow (B \rightarrow C)$	/	$(C \wedge A) \rightarrow B$
T	F	T		Ⓣ	T	T
T	F	T		Ⓣ	T	Ⓣ

**3-5.** Dan's wife received the message  $\rightarrow$  Dan's wife is the person who called  
 $[\lambda xy (x \text{ received } y)]$  Dan's wife the message  $\rightarrow$  Dan's wife = the person who called  
 $R(\text{Dan's wife})m \rightarrow [\lambda x (x \text{'s wife})]$  Dan = p  
 $R(\text{fd})m \rightarrow \text{fd} = p$

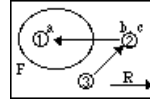
[R:  $\lambda xy (x \text{ received } y)$ ; d: Dan; f:  $\lambda x (x \text{'s wife})$ ; m: the message; p: the person who called]

**3-6.** [This question was on a topic not covered in FO4]

- a.** The following are the possibilities; in the last,  $\tau$  may be any term:  
 $[\lambda x Rxbx]a$ ,  $[\lambda x Rxba]a$ ,  $[\lambda x Rabx]a$ ,  $[\lambda x Raxa]b$ ,  $[\lambda x Raba]\tau$
- b.**  $Paa \wedge Qba$

**4-** alias sets

- 1.**  
 1: a, fa, fb  
 2: b, c  
 3: gc



range: 1, 2, 3			f	g	F	R	1	2	3
a	b	c	---	---	---	---	---	---	---
---	---	---	1	1	1	1	1	F	F
1	2	2	2	1	2	2	2	F	F
---	---	---	3	1	3	3	3	F	F

a = fb	fa = fb	b = c	Fa	$\neg F(gc)$	Rb(fa)	$\neg Ra(fb)$	R(gc)c
1 T 12	11 T 12	2 T 2	T 1	T F 32	T 2 11	T F 1 12	T 3 2 2

**4-2.**

	$Fa \wedge \neg Fb$	1
1 Ext	$Fa$	(4)
1 Ext	$\neg Fb$	(4)
	$b = c$	a,b=c
	$a = c$	a=b=c
	•	
	$\perp$	3
4 Nec=		
3 RAA	$\neg a = c$	2
2 CP	$b = c \rightarrow \neg a = c$	

**4-3.**

	$fa = c$	
	$fb = c$	a,b,c=fa=fb
	$Rc(fa) \rightarrow Ra(fa)$	3
	$R(fa)(fb)$	(4)
	$\neg Rb(fb)$	
	•	
4 QED=	$Rc(fa)$	3
	$Ra(fa)$	
	o	$fa=c, fb=c, R(fa)(fb), \neg Rb(fb), Ra(fa) \Rightarrow \perp$
	$\perp$	3
3 RC	$\perp$	2
2 IP	$Rb(fb)$	1
1 CP	$R(fa)(fb) \rightarrow Rb(fb)$	