

### Phi 270 Foo test 3

Analyze the sentences below in as much detail as possible *using connectives*; that is, you *should not* identify components that are individual terms (or predicates or functors). Present the result in *both symbolic and English notation*. Be sure that the unanalyzed components of your answer are complete and independent sentences; also try to respect any grouping in the English.

1. *If it rains, you will get wet if you're outside*

[ answer ]

2. *Al missed breakfast only if he overslept*

[ answer ]

Use derivations to check whether each of the entailments below holds. You may use detachment and attachment rules. If an entailment fails, present a counterexample that divides an open gap.

3.  $A \rightarrow (B \rightarrow C) \Rightarrow (A \rightarrow \neg C) \rightarrow (A \rightarrow \neg B)$

[ answer ]

4.  $A \rightarrow B \Rightarrow \neg A \wedge B$

[ answer ]

Analyze the sentence below in as much detail as possible. In this case you *should* identify components that are individual terms, predicates, or functors. Be sure that the unanalyzed components of your answer are independent (in particular, that none contains a pronoun whose antecedent is in another).

5. *Unless Al is the file's owner, the system didn't let him open it*

[ answer ]

[The following question was on a topic not covered in FO4] Expand the following sentence in all possible ways on each of the terms appearing in it (i.e., you need not use vacuous abstraction).

6.  $\text{Tabc}$

[ answer ]

Use a derivation to show that the entailment below holds. You may use detachment and attachment rules.

7.  $A \rightarrow \text{Ra(fb)}, \text{Rb(fa)} \rightarrow \text{Ga} \Rightarrow A \rightarrow (\neg \text{Gb} \rightarrow \neg a=b)$

[ answer ]

---

### Phi 270 Foo test 3 answers

1. *it will rain*  $\rightarrow$  *you will get wet if you're outside*  
*it will rain*  $\rightarrow$  (*you will get wet*  $\leftarrow$  *you will be outside*)  
 $R \rightarrow (W \leftarrow O)$  [or:  $R \rightarrow (O \rightarrow W)$ ]  
 if R then if O then W

[O: *you will be outside*; R: *it will rain*; W: *you will get wet*]

2.  $\neg$  *Al missed breakfast*  $\leftarrow$   $\neg$  *Al overslept*  
 $\neg M \leftarrow \neg O$  [or:  $\neg O \rightarrow \neg M$ ]  
 if not O then not M

[M: *Al missed breakfast*; O: *Al overslept*]

3.

	$A \rightarrow (B \rightarrow C)$	3
	$A \rightarrow \neg C$	4
	$A$	(3),(4)
3 MPP	$B \rightarrow C$	5
4 MPP	$\neg C$	(5)
5 MTT	$\neg B$	(6)
	•	
6 QED	$\neg B$	2
2 CP	$A \rightarrow \neg B$	1
1 CP	$(A \rightarrow \neg C) \rightarrow (A \rightarrow \neg B)$	

4.

	$A \rightarrow B$	3,5
	$A$	(3)
3 MPP	$B$	
	○	$A, B \not\Rightarrow \perp$
	$\perp$	2
2 RAA	$\neg A$	1
	$\neg B$	(5)
5 MTT	$\neg A$	
	○	$\neg A, \neg B \not\Rightarrow \perp$
	$\perp$	4
4 IP	$B$	1
1 Cnj	$\neg A \wedge B$	

A	B	$A \rightarrow B / \neg A \wedge B$			
T	T	T	F	F	divides 1st gap
F	F	T	T	F	divides 2nd gap

5.  $\neg Al$  is the file's owner  $\rightarrow$  the system didn't let Al open the file  
 $\neg Al$  is the file's owner  $\rightarrow \neg$  the system let Al open the file  
 $\neg Al =$  the file's owner  $\rightarrow \neg [\lambda xyz (x \text{ let } y \text{ open } z)]$  the system Al the file

$\neg a = [\lambda x (x \text{'s owner})] \text{ the file} \rightarrow \neg \text{Lsaf}$   
 $\neg a = \text{of} \rightarrow \neg \text{Lsaf}$

[L:  $\lambda xyz (x \text{ let } y \text{ open } z)$ ; a: Al; f: the file; o:  $\lambda x (x \text{'s owner})$ ; s: the system]

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

$[\lambda x T x b c] a$

$[\lambda x T a x c] b$

$[\lambda x T a b x] c$

- 7.

	A $\rightarrow$ Ra(fb)		
	Rb(fa) $\rightarrow$ Ga		4
	A		
	Ra(fb)		(5)
	$\neg$ Gb		(6)
	a=b		a=b, fa=fb
	•		
5 QED=	Rb(fa)		4
	Ga		(6)
	•		
6 Nc=	$\perp$		4
4 RC	$\perp$		3
3 RAA	$\neg$ a=b		2
2 CP	$\neg$ Gb $\rightarrow$ $\neg$ a=b		1
1 CP	A $\rightarrow$ ( $\neg$ Gb $\rightarrow$ $\neg$ a=b)		