

### Phi 270 F03 test 4 in pdf format

Analyze the sentences below in as much detail as possible, providing a key to the non-logical vocabulary you use. *Restate 2 using an unrestricted quantifier.*

1. *No one called the new number*  
[ answer ]
2. *Sam asked everyone he could think of* [Remember to restate this one using an unrestricted quantifier.]  
[ answer ]
3. *If any door was opened, the alarm sounded*  
[ answer ]
4. *Only people who'd read everything the author had written were asked to review the book*  
[ answer ]

Use derivations to show that the following arguments are valid. You may use any rules.

5. 
$$\frac{\forall x (Fx \wedge Gx)}{\forall x Gx}$$
  
[ answer ]
6. 
$$\frac{(\forall x: Fx) Gx \quad \forall x \forall y (Gy \rightarrow Rxy)}{\forall x (\forall y: Fy) Rxy}$$
  
[ answer ]

Use a derivation to show that the following argument is not valid and describe a structure (by using either a diagram or tables) that divides an open gap.

7. 
$$\frac{(\forall x: Fx) Rxa}{Fa \rightarrow \forall x Rxx}$$
  
[ answer ]

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### Phi 270 F03 test 4 answers

1. *No one called the new number*  
*No one is such that (he or she called the new number)*  
 $(\forall x: x \text{ is a person}) \neg x \text{ called the new number}$   
 $(\forall x: Px) \neg Cxn$   
[C:  $\lambda xy$  (x called y); P:  $\lambda x$  (x is a person); n: the new number]
2. *Sam asked everyone he could think of*  
*everyone Sam could think of is such that (Sam asked him or her)*  
 $(\forall x: x \text{ is a person Sam could think of}) \text{ Sam asked } x$   
 $(\forall x: x \text{ is a person} \wedge \text{ Sam could think of } x) \text{ Asx}$   
 $(\forall x: Px \wedge Tsx) \text{ Asx}$   
 $\forall x ((Px \wedge Tsx) \rightarrow \text{Asx})$   
[A:  $\lambda xy$  (x asked y); P:  $\lambda x$  (x is a person); T:  $\lambda xy$  (x could think of y); s: Sam]

3. *If any door was opened, the alarm sounded every door is such that (if it was opened, the alarm sounded)*  
*( $\forall x$ : x is a door) if x was opened, the alarm sounded*  
*( $\forall x$ : Dx) (x was opened  $\rightarrow$  the alarm sounded)*  
 $(\forall x: Dx) (Ox \rightarrow Sa)$   
 [D:  $\lambda x$  (x is a door); O:  $\lambda x$  (x was opened); S:  $\lambda x$  (x sounded); a: the alarm]
4. *Only people who'd read everything the author had written were asked to review the book*  
*Only people who'd read everything the author had written are such that (they were asked to review the book)*  
*( $\forall x$ :  $\neg$  x is a person who'd read everything the author had written)*  
 *$\neg$  x was asked to review the book*  
*( $\forall x$ :  $\neg$  (x is a person  $\wedge$  x had read everything the author had written))  $\neg$  Axb*  
*( $\forall x$ :  $\neg$  (x is a person  $\wedge$  everything the author had written is such that (x had read it)))  $\neg$  Axb*  
*( $\forall x$ :  $\neg$  (Px  $\wedge$  ( $\forall y$ : y is a thing the author had written) x had read y))  $\neg$  Axb*  
*( $\forall x$ :  $\neg$  (Px  $\wedge$  ( $\forall y$ : the author had written y) Rxy))  $\neg$  Axb*  
 $(\forall x: \neg (Px \wedge (\forall y: Way) Rxy)) \neg Axb$   
 [A:  $\lambda xy$  (x was asked to review y); P:  $\lambda x$  (x is a person); R:  $\lambda xy$  (x had read y); R:  $\lambda xy$  (x had written y); a: the author; b: the book]

5.

|       |                            |      |
|-------|----------------------------|------|
|       | $\forall x (Fx \wedge Gx)$ | a: 2 |
|       | ⓐ                          |      |
| 2 UI  | Fa $\wedge$ Ga             | 3    |
| 3 Ext | Fa                         |      |
| 3 Ext | Ga                         | (4)  |
|       | •                          |      |
|       | Ga                         | 1    |
| 4 QED |                            |      |
| 1 UG  | $\forall x Gx$             |      |

6.

|       |  |     |
|-------|--|-----|
|       | $(\forall x: Fx) Gx$                       | b:3 |
|       | $\forall x \forall y (Gy \rightarrow Rxy)$ | a:4 |
|       | (a)  |     |
|       | (b)  |     |
|       | Fb   | (3) |
| 3 SB  | Gb   | (6) |
| 4 UI  | $\forall y (Gy \rightarrow Ray)$           | b:5 |
| 5 UI  | $Gb \rightarrow Rab$                       | 6   |
| 6 MPP | Rab  | (7) |
|       | •  |     |
| 7 QED | Rab  | 2   |
| 2 RUG | $(\forall y: Fy) Ray$                      | 1   |
| 1 UG  | $\forall x (\forall y: Fy) Rxy$            |     |

7.

|       |                                |  |
|-------|--------------------------------|--|
|       | $(\forall x: Fx) Rxa$          | a:2, b:5                                       |
|       | Fa                             | (2)  |
| 2 SB  | Raa                            |  |
|       | (b)                            |  |
|       | $\neg Rbb$                     |  |
|       | $\neg Fb$                      |  |
|       | ○                              | $Fa, Raa, \neg Rbb, \neg Fb \Rightarrow \perp$ |
|       | ⊥                              | 6  |
| 6 IP  | Fb                             | 5  |
|       | Rba                            |  |
|       | ○                              | $Fa, Raa, \neg Rbb, Rba \Rightarrow \perp$     |
|       | ⊥                              | 5  |
| 5 MCR | ⊥                              | 4  |
| 4 IP  | Rbb                            | 3  |
| 3 UG  | $\forall x Rxx$                | 1  |
| 1 CP  | $Fa \rightarrow \forall x Rxx$ |  |

Counterexample presented by tables

|             |     |                   |         |
|-------------|-----|-------------------|---------|
| range: 1, 2 | a b | $\tau$   F $\tau$ | R   1 2 |
|             | 1 2 | 1   T             | 1   T F |
|             |     | 2   F             | 2   T F |

(This interpretation divides both gaps; the value of F2 is needed only for the 1st and the value of R21 only for the 2nd.)

Counterexample presented by a diagram

