Phi 270 F09 test 3

Analyze the sentences below in as much detail as possible *using only connectives*; that is, the unanalyzed components should all be sentences (rather than individual terms, 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 the package was sent, then it was lost.

2. Al finished the project only if he had help; but he started it unless there was a rush order.

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. $A \to C, B \to \neg C \vDash A \to \neg B$

4. $B \to (A \to C) \vDash (B \wedge C) \to D$

Analyze the sentence below in as much detail as possible, giving a key to your abbreviations of unanalyzed expressions. In this case you *should* identify components that are individual terms, predicates, or functors; however, you do *not* need to present the result in English notation (i.e., symbolic notation is enough). Your analysis should be in reduced form (i.e., you *should not* use abstracts and variables), so be sure that the unanalyzed components of your answer are independent—in particular, that none contains a pronoun whose antecedent is in another. (Also be sure also that the individual terms you identify really are individual terms and are not quantifier phrases or general terms, like simple common nouns.)

5. Al sold his car to the first caller, and he bought Dave's truck.

Analyze the sentence below using abstracts and variables to represent pronominal cross reference (instead of replacing pronouns by their antecedents). That is, use expanded form to the extent necessary so that each individual term in your analysis appears only as often as it appears in the original sentence. In other respects, your analysis should be as described for **5**.

6. If Bill went to Chicago, then Ann didn't reach him.

Use a derivation to show that the entailment below holds. You may use detachment and attachment rules. Be sure to indicate the alias sets whenever an equation is added to the resources.

7. $a = fb, fc = d \vDash (b = c \wedge \neg Fc) \to (a = d \wedge \neg Fb)$

Phi 270 F09 test 3 answers

1. If the package was sent, then it was lost.
the package was sent → the package was lost

$$S \to L$$

if S then L

L: the package was lost; S: the package was sent

2. Al finished the project only if he had help; but he started it unless there was a rush order
Al finished the project only if he had help
∧ Al started the project unless there was a rush order
(¬ Al finished the project ← ¬ Al had help)
∧ (Al started the project ← ¬ there was a rush order)

$$(\neg F \leftarrow \neg H) \wedge (S \leftarrow \neg R)$$
$$(\neg H \to \neg F) \wedge (\neg R \to S)$$

both if not H then not F and if not R then S

F: Al finished the project; H: Al had help; R: there was a rush order; S: Al started the project

3.

	$A \to C$	2
	$B \to \neg C$	3
	A	(2)
2 MPP	C	(3)
3 MTT	¬ B	(4)
	●	
4 QED	¬ B	1
1 CP	$A \to \neg B$	

4.

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

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

The first interpretation divides the first dead end gap, and both divide the second. It is enough to reach one of the two dead ends and to present one counterexample that divides that gap.

5. Al sold his car to the first caller, and he bought Dave's truck

Al sold his car to the first caller ∧ Al bought Dave's truck

[_ sold _ to _] Al Al's car the first caller ∧ [_ bought _] Al Dave's truck

S a (Al's car) f ∧ B a (Dave's truck)

S a ([_'s car] Al) f ∧ B a ([_'s truck] Dave)

Sa(ca)f ∧ Ba(td)

B: [_ bought _]; S: [_ sold _ to _]; c: [_'s car]; t: [_'s truck]; a: Al; d: Dave

6. If Bill went to Chicago, then Ann didn't reach him

Bill is such that (if he went to Chicago, then Ann didn't reach him)

[if x went to Chicago, then Ann didn't reach $x]_x$ Bill

[x went to Chicago → Ann didn't reach $x]_x$ b

[x went to Chicago → ¬ Ann reached $x]_x$ b

[[_ went to _] x Chicago → ¬ [_ reached _] Ann $x]_x$ b

$[Wxc \rightarrow \neg Rax]_x b$

R: [_ reached _]; W: [_ went to _]; a: Ann; b: Bill; c: Chicago

7.

	$a = fb$ $fc = d$	a–fb, b, fc–d, c
	$b = c \wedge \neg Fc$	2
2 Ext	$b = c$	a–fb–fc–d, b–c
2 Ext	$\neg Fc$	(6)
	●	
4 EC	$a = d$	3
	Fb	(6)
	●	
6 Nc=	$\perp$	
5 RAA	$\neg Fb$	3
3 Cnj	$a = d \wedge \neg Fb$	1
1 CP	$(b = c \wedge \neg Fc) \rightarrow (a = d \wedge \neg Fb)$	

It is also possible to close the second gap at stage 5 using QED=.

Phi 270 F08 test 3

Analyze the sentences below in as much detail as possible *using only connectives*; that is, the unanalyzed components should all be sentences (rather than individual terms, 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 John was invited, then he attended if he was free.

2. Unless we find the key, we'll get in only if we break the lock.

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. $B \to C \vDash (A \wedge B) \to C$

4. $\neg (C \to D) \to (A \to B) \vDash A \to D$

Analyze the sentence below in as much detail as possible, giving a key to your abbreviations of unanalyzed expressions. In this case you *should* identify components that are individual terms, predicates, or functors; however, you do *not* need to present the result in English notation (i.e., symbolic notation is enough). Your analysis should be in reduced form (i.e., you *should not* use abstracts and variables), so be sure that the unanalyzed components of your answer are independent—in particular, that none contains a pronoun whose antecedent is in another. (Also be sure also that the individual terms you identify really are individual terms and are not quantifier phrases or general terms, like simple common nouns.)

5. Sam wrote to Linda, and she sent his book to him.

Analyze the sentence below using abstracts and variables to represent pronominal cross reference (instead of replacing pronouns by their antecedents). That is, use expanded form to the extent necessary so that each individual term in your analysis appears only as often as it appears in the original sentence. In other respects, your analysis should be as described for **5**.

6. The rock hit the road, but it didn't hit Oscar.

Use a derivation to show that the entailment below holds. You may use detachment and attachment rules. Be sure to indicate the alias sets whenever an equation is added to the resources.

7. $Ra(fb), fa = gb \vDash a = b \to (Rb(ga) \wedge fb = gb)$

Phi 270 F08 test 3 answers

1. If John was invited, then he attended if he was free

John was invited → John attended if he was free

John was invited → (John attended ← John was free)

$$I \to (A \leftarrow F)$$

$$I \to (F \to A)$$

if I then if F then A

A: John attended; F: John was free; I: John was invited

2. Unless we find the key, we'll get in only if we break the lock

¬ we will find the key → we'll get in only if we break the lock

¬ we will find the key → (¬ we'll get in ← ¬ we'll break the lock)

$$\neg F \to (\neg G \leftarrow \neg B)$$

$$\neg F \to (\neg B \to \neg G)$$

if not F then if not B then not G

B: we'll break the lock; F: we will find the key; G: we'll get in

3.

	$B \to C$	3
	$A \wedge B$	2
2 Ext	A	
2 Ext	B	(3)
3 MPP	C	(4)
	●	
4 QED	C	1
1 CP	$(A \wedge B) \to C$	

4.

	¬ (C → D) → (A → B)	3
	A	(6)
	¬ D	(5)
	C → D	5
5 MTT	¬ C	
	○	¬ C, ¬ D, A ⊭ ⊥
	⊥	4
4 RAA	¬ (C → D)	3
	A → B	6
6 MPP	B	
	○	B, ¬ D, A ⊭ ⊥
	⊥	3
3 RC	⊥	2
2 IP	D	1
1 CP	A → D	

A B C D	¬ (C → D) → (A → B) / A → D				
T F F F	F	T	Ⓣ	F	Ⓕ
T T F F	F	T	Ⓣ	T	Ⓕ
T T T F	T	F	Ⓣ	T	Ⓕ

The first two interpretations divide the first dead end gap, and the last two divide the second. It is enough to reach one of the two dead ends and to present one of the two counterexamples that divide that gap.

5. Sam wrote to Linda, and she sent his book to him

Sam wrote to Linda ∧ Linda sent Sam's book to him

Sam wrote to Linda ∧ Linda sent Sam's book to Sam

[_ wrote to _] Sam Linda ∧ [_ sent _ to _] Linda Sam's book Sam

Wsl ∧ Sl([_'s book] Sam)s

Wsl ∧ Sl(bs)s

S: [_ sent _ to _]; W: [_ wrote to _]; b: [_'s book]; l: Linda; s: Sam

6. The rock hit the road, but it didn't hit Oscar

The rock is such that (it hit the road, but it didn't hit Oscar)

[x hit the road, but x didn't hit Oscar]$_x$ the rock

[x hit the road ∧ x didn't hit Oscar]$_x$ the rock

[x hit the road ∧ ¬ x hit Oscar]$_x$ the rock

[Hxr ∧ ¬ Hxo]$_x$k

H: [_ hit _]; k: the rock; o: Oscar; r: the road

7.

	Ra(fb)	(3)
	fa = gb	a, b, fb, fa–gb, ga
	a = b	a–b, fb–fa–gb–ga
	●	
3 QED=	Rb(ga)	2
	●	
4 EC	fb = gb	2
2 Cnj	Rb(ga) ∧ fb = gb	1
1 CP	a = b → (Rb(ga) ∧ fb = gb)	

Phi 270 F06 test 3

Analyze the sentences below in as much detail as possible *using only connectives*; that is, the unanalyzed components should all be sentences (rather than individual terms, 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. There was an audience if there was food.

2. Sam went unless he had to work, but he enjoyed the ride only if the weather was good.

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. $C \to (B \to A), C \to B \vDash C \to A$

4. $A \to B, C \to D \vDash C \to (E \to \neg B)$

Analyze the sentence below in as much detail as possible, giving a key to your abbreviations of unanalyzed expressions. In this case you *should* identify components that are individual terms, predicates, or functors; however, you do *not* need to present the result in English notation (i.e., symbolic notation is enough). Your analysis should be in reduced form (i.e., you *should not* use abstracts and variables), so be sure that the unanalyzed components of your answer are independent—in particular, that none contains a pronoun whose antecedent is in another. (Also be sure also that the individual terms you identify really are individual terms and are not quantifier phrases or general terms, like simple common nouns.)

5. Nancy phoned Oliver and told him about his promotion.

Analyze the sentence using abstracts and variables to represent pronominal cross reference (instead of replacing pronouns by their antecedents). That is, each individual term in your analysis should appear only as often as it appears in the original sentence. In other respects, your analysis should be as described for **5**.

6. Spot finished chewing his bone, and he buried it in a flowerbed.

Use a derivation to show that the entailment below holds. You may use detachment and attachment rules. Be sure to indicate the alias sets whenever an equation is added to the resources.

7. $Ra(fb) \wedge \neg Rc(fd), fb = fc \vDash \neg (a = c \wedge b = d)$

Phi 270 F06 test 3 answers

1. There was an audience if there was food

there was an audience ← there was food

$$A \leftarrow F$$

$$F \to A$$

if F then A

A: there was an audience; F: there was food

2. Sam went unless he had to work, but he enjoyed the ride only if the weather was good

Sam went unless he had to work ∧ Sam enjoyed the ride only if the weather was good

(Sam went ← ¬ Sam had to work) ∧ (¬ Sam enjoyed the ride ← ¬ the weather was good)

$$(N \leftarrow \neg R) \wedge (\neg E \leftarrow \neg G)$$

$$(\neg R \to N) \wedge (\neg G \leftarrow \neg E)$$

both if not R then N and if not G then not E

E: Sam enjoyed the ride; G: the weather was good; N: Sam went; R: Sam had to work

3.

	$C \to (B \to A)$	2
	$C \to B$	3
	C	(2), (3)
2 MPP	$B \to A$	4
3 MPP	B	(4)
4 MPP	A	(5)
	●	
5 QED	A	1
1 CP	$C \to A$	

4.

	A → B	5
	C → D	2
	C	(2)
2 MPP	D	
	E	
	B	
	¬ A	
	○	¬ A, B, C, D, E ⊭ ⊥
	⊥	6
6 IP	A	5
	B	
	○	B, C, D, E ⊭ ⊥
	⊥	5
5 RC	⊥	4
4 RAA	¬ B	3
3 CP	E → ¬ B	1
1 CP	C → (E → ¬ B)	

A	B	C	D	E	A → B, C → D / C → (E → ¬ B)
F	T	T	T	T	Ⓣ Ⓣ Ⓕ F F

5. Nancy phoned Oliver and told him about his promotion

Nancy phoned Oliver ∧ Nancy told Oliver about his promotion

Nancy phoned Oliver ∧ Nancy told Oliver about his promotion

[_ phoned _] Nancy Oliver ∧ [_ told _ about _] Nancy Oliver Oliver's promotion

Pno ∧ Tno([_'s promotion] Oliver)

Pno ∧ Tno(po)

P: [_ phoned _]; T: [_ told _ about _]; n: Nancy; o: Oliver; p: [_'s promotion]

6. Spot finished chewing his bone, and he buried it in a flowerbed

Spot is such that (he finished chewing his bone, and he buried it in a flowerbed)

[x finished chewing x's bone, and x buried it in a flowerbed]$_x$ Spot

[x's bone is such that (x finished chewing it, and x buried it in a flowerbed)]$_x$s

[[x finished chewing y, and x buried y in a flowerbed]$_y$ x's bone]$_x$s

[[x finished chewing y ∧ x buried y in a flowerbed]$_y$([_'s bone] x)]$_x$s

$$[[Cxy \wedge Bxy]_y(bx)]_x s$$

or: $[[Cxy \wedge Bxy]_{xy}z(bz)]_z s$

B: [_ buried _ in a flowerbed]; C: [_ finished chewing _]; b: [_'s bone]; s: Spot

(Note: a flowerbed is not an individual term so it must remain unanalyzed as part of a predicate)

7.

	Ra(fb) ∧ ¬ Rc(fd)	1
	fb = fc	a, b, c, d, fb—fc, fd
1 Ext	Ra(fb)	(4)
1 Ext	¬ Rc(fd)	(4)
	a = c ∧ b = d	3
3 Ext	a = c	a—c, b, d, fb—fc, fd
3 Ext	b = d	a—c, b—d, fc—fb—fd
	●	
4 Nc=	⊥	2
2 RAA	¬ (a = c ∧ b = d)	

Phi 270 F05 test 3

Analyze the sentences below in as much detail as possible *using only connectives;* that is, the unanalyzed components should all be sentences (rather than individual terms, 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 the part was fixed, it broke again.

2. Unless Tom was early, he got in only if he paid extra.

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. $A \to (B \to C), C \to D \vDash B \to (A \to D)$

4. $(C \wedge A) \to B \vDash (A \wedge B) \to C$

Analyze the sentence below in as much detail as possible, giving a key to your abbreviations of unanalyzed expressions. In this case you *should* identify components that are individual terms, predicates, or functors; however, you do not need to present the result in English notation (i.e., symbolic notation is enough). (Be sure that the unanalyzed components of your answer are independent—in particular, that none contains a pronoun whose antecedent is in another—and be sure also that the individual terms you identify really are individual terms rather than general terms or quantifier phrases.)

5. Either Fred is the manager or he owns the business.

6. Sam received a recall notice from the manufacturer of his car.

Use a derivation to show that the entailment below holds. You may use detachment and attachment rules. (Be sure to indicate the alias sets whenever an equation is added to the resources.)

7. $Rb(fa), fb = gc, c = fb, d = gc \vDash c = d \wedge (a = b \to Ra(gd))$

Phi 270 F05 test 3 answers

1. If the part was fixed, it broke again

the part was fixed → the part broke again

$$F \to B$$

if F then B

B: the part broke again; F: the part was fixed

2. Unless Tom was early, he got in only if he paid extra

¬ Tom was early → Tom got in only if he paid extra

¬ Tom was early → (¬ Tom got in ← ¬ Tom paid extra)

$$\neg T \to (\neg G \leftarrow \neg P)$$

$$\neg T \to (\neg P \to \neg G)$$

if not T then if not P then not G

G: Tom got in; P: Tom paid extra; T: Tom was early

3.

	A → (B → C)	3
	C → D	5
	B	(4)
	A	(3)
3 MPP	B → C	4
4 MPP	C	(5)
5 MPP	D	(6)
	●	
6 QED	D	2
2 CP	A → D	1
1 CP	B → (A → D)	

4.

	$(C \wedge A) \rightarrow B$	4
	$A \wedge B$	2
2 Ext	A	(7)
2 Ext	B	
	$\neg C$	
	$\neg C$	
	○	A, B, $\neg C \nvDash \perp$
	$\perp$	6
6 IP	C	5
	●	
7 QED	A	5
5 Cnj	$C \wedge A$	4
	B	
	○	A, B, $\neg C \nvDash \perp$
	$\perp$	4
4 RC	$\perp$	3
3 IP	C	1
1 CP	$(A \wedge B) \rightarrow C$	

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

5. Either Fred is the manager or he owns the business

Fred is the manager ∨ Fred owns the business

Fred = the manager ∨ [_ owns _] Fred the business

f = m ∨ Ofb

O: [_ owns _]; b: the business; f: Fred; m: the manager

6. Sam received a recall notice from the manufacturer of his car

Sam received a recall notice from the manufacturer of his car

[_ received a recall notice from _] Sam the manufacturer of Sam's car

R s (the manufacturer of Sam's car)

R s ([the manufacturer of _)] Sam's car)

R s (m (Sam's car))

R s (m ([_'s car] Sam))

Rs(m(cs))

R: [_ received a recall notice from _]; c: [_'s car]; m: [the manufacturer of _]; s: Sam

7.

	$Rb(fa)$	(4)
	$fb = gc$	fb–gc, a, b, c, d, fa, gd
	$c = fb$	c–fb–gc, a, b, d, fa, gd
	$d = gc$	c–fb–gc–d–gd, a, b, fa
	●	
2 EC	$c = d$	1
	$a = b$	c–fb–gc–d–gd–fa, a–b
	●	
4 QED=	$Ra(gd)$	3
3 CP	$a = b \rightarrow Ra(gd)$	1
1 Cnj	$c = d \wedge (a = b \rightarrow Ra(gd))$	

Phi 270 F04 test 3

Analyze the sentences below in as much detail as possible *using only connectives*; that is, the unanalyzed components should all be sentences (rather than individual terms, 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. Dan wasn't home unless it was a holiday.

2. If ten days had passed, then the return was accepted only if the item was damaged.

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

4. $A \rightarrow B \vDash B \rightarrow C$

Analyze the sentence below in as much detail as possible, giving a key to your abbreviations of unanalyzed expressions. In this case you *should*identify components that are individual terms, predicates, or functors; however, you do not need to present the result in English notation (i.e., symbolic notation is enough). (Be sure that the unanalyzed components of your answer are independent—in particular, that none contains a pronoun whose antecedent is in another—and be sure also that the individual terms you identify really are individual terms rather than general terms or quantifier phrases.)

5. Ann called Bill and he picked her up at the garage.

6. If Carol's father is Dave's boss, then she has either met Dave or heard her father speak of him.

Use a derivation to show that the entailment below holds. You may use detachment and attachment rules. (Be sure to indicate the alias sets at each stage when they change.)

7. $a = fc, b = fd, Rac \vDash c = d \rightarrow Rbd$

Phi 270 F04 test 3 answers

1. Dan wasn't home unless it was a holiday

Dan wasn't home ← ¬ it was a holiday

¬ Dan was home ← ¬ it was a holiday

$\neg H \leftarrow \neg D$

$\neg D \rightarrow \neg H$

if not D then not H

H: Dan was home; D: it was a holiday

2. If ten days had passed, then the return was accepted only if the item was damaged

ten days had passed → the return was accepted only if the item was damaged

ten days had passed → (¬ the return was accepted ← ¬ the item was damaged)

$T \rightarrow (\neg A \leftarrow \neg D)$

$T \rightarrow (\neg D \rightarrow \neg A)$

if T then if not D then not A

T: ten days had passed; D: the item was damaged; A: the return was accepted

3.

	$A \rightarrow (B \rightarrow \neg C)$	4
	C	(6)
	B	(5)
	A	(4)
4 MPP	$B \rightarrow \neg C$	5
5 MPP	$\neg C$	(6)
	●	
6 Nc	⊥	3
3 RAA	$\neg A$	2
2 CP	$B \rightarrow \neg A$	1
1 CP	$C \rightarrow (B \rightarrow \neg A)$	

4.

	A → B	3
	B	
	¬ C	
	¬ A	
	○	¬ A, B, ¬ C ⊭ ⊥
	⊥	4
4 IP	A	3
	B	
	○	B, ¬ C ⊭ ⊥
	⊥	3
3 RC	⊥	2
2 IP	C	1
1 CP	B → C	

A	B	C	A → B / B → C
T	T	F	Ⓣ Ⓕ
F	T	F	Ⓣ Ⓕ

The first row divides the second gap and the second row divides both

5. Ann called Bill and he picked her up at the garage

Ann called Bill ∧ Bill picked Ann up at the garage

[_ called _] Ann Bill ∧ [_ picked _ up at _] Bill Ann the garage

Cab ∧ Pbag

C: [_ called _]; P: [_ picked _ up at _]; a: Ann; b: Bill; g: the garage

6. If Carol's father is Dave's boss, then she has either met Dave or heard her father speak of him

Carol's father is Dave's boss

→ Carol has either met Dave or heard her father speak of him

Carol's father = Dave's boss

→ (Carol has met Dave ∨ Carol has heard her father speak of Dave)

[_'s father] Carol = [_'s boss] Dave

→ (Carol has met Dave ∨ Carol has heard Carol's father speak of Dave)

fc = bd → ([_ has met _] Carol Dave

∨ [_ has heard _ speak of _] Carol Carol's father Dave)

fc = bd → (Mcd ∨ Hc(fc)d)

M: [_ has met _]; H: [_ has heard _ speak of _]; f: [_'s father]; b: [_'s boss]; c: Carol; d: Dave

7.

	a = fc	
	b = fd	a-fc, b-fd, c, d
	Rac	(2)
	c = d	a-fc-b-fd, c-d
	●	
2 QED=	Rbd	1
1 CP	c = d → Rbd	

Phi 270 F03 test 3

Analyze the sentences below in as much detail as possible *using only 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 was cloudy, Bob didn't see the eclipse

2. Unless the lock is broken, you can get in only if you have a key

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

3. $A \rightarrow \neg C, B \rightarrow C \vDash A \rightarrow \neg B$

4. $(A \wedge B) \rightarrow C \vDash B \rightarrow (\neg C \rightarrow A)$

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. If Sam asked Tom to drive him to the meeting, then he is the person who called earlier

6. Dave's father called the mother of the child who hit him

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

7. $a = b \wedge Rac \vDash fa = c \rightarrow Rb(fb)$

Phi 270 F03 test 3 answers

1. If it was cloudy, Bob didn't see the eclipse

it was cloudy → Bob didn't see the eclipse

it was cloudy → ¬ Bob saw the eclipse

$C \rightarrow \neg S$

if C then not S

C: it was cloudy; S: Bob saw the eclipse

2. Unless the lock is broken, you can get in only if you have a key

¬ the lock is broken → you can get in only if you have a key

¬ the lock is broken → (¬ you can get in ← ¬ you have a key)

$\neg B \rightarrow (\neg G \leftarrow \neg K)$

$\neg B \rightarrow (\neg K \rightarrow \neg G)$

if not B then if not K then not G

B: the lock is broken; G: you can get in; K: you have a key

3.

	A → ¬ C	2
	B → C	3
	A	(2)
2 MPP	¬ C	(3)
3 MTT	¬ B	(4)
	●	
4 QED	¬ B	1
1 CP	A → ¬ B	

4.

	(A ∧ B) → C	3
	B	(4)
	¬ C	(3)
3 MTT	¬ (A ∧ B)	4
4 MPT	¬ A	
	¬ A	
	○	¬ A, B, ¬ C ⊭ ⊥
	⊥	5
5 IP	A	2
2 CP	¬ C → A	1
1 CP	B → (¬ C → A)	

A B C	(A ∧ B) → C / B → (¬ C → A)
F T F	F Ⓣ Ⓕ T F

5. If Sam asked Tom to drive him to the meeting, then he is the person who called earlier

Sam asked Tom to drive him to the meeting → Sam is the person who called earlier

[_ asked _ to drive _ to _] Sam Tom Sam the meeting → Sam = the person who called earlier

Astsm → s = p

A: [_ asked _ to drive _ to _]; m: the meeting; p: the person who called earlier; s: Sam; t: Tom

6. Dave's father called the mother of the child who hit him

[_ called _] Dave's father the mother of the child who hit Dave

C([_'s father] Dave)([the mother of _](the child who hit Dave))

C(fd)(m([the child who hit _]d))

C(fd)(m(hd))

C: [_ called _]; d: Dave; f: [_'s father]; h: [the child who hit _]; m: [the mother of _]

7.

	a = b ∧ Rac	1
1 Ext	a = b	a-b, c, fa-fb
1 Ext	Rac	(3)
	fa = c	a-b, c-fa-fb
	●	
3 QED=	Rb(fb)	2
2 CP	fa = c → Rb(fb)	

Phi 270 F02 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. They'll be here soon unless they had car trouble

2. If it snowed, then the schools were open only if the plows got out early.

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 → (¬ B → C) ⊨ ¬ C → (A → B)

4. A → (¬ B → C) ⊨ C → (A → B)

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. Al is Bob's father and Bob works for him

Synthesize an English sentence with the following logical form:

6. Sa(mb) → ¬ S(ma)b

S: [_ went to school with _]; a: Al; b: Bob; m: [_'s mother]

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

7. Fa → C, Fb ⊨ a = b → C

Phi 270 F02 test 3 answers

1. They'll be here soon unless they had car trouble

They'll be here soon ← ¬ they had car trouble

S ← ¬ T [*or:* ¬ T → S]

if not T then S

S: they'll be here soon; T: they had car trouble

2. If it snowed, then the schools were open only if the plows got out early

it snowed → the schools were open only if the plows got out early

it snowed → (¬ the schools were open ← ¬ the plows got out early)

S → (¬ O ← ¬ E) [*or:* S → (¬ E → ¬ O)]

if S then if not E then not O

E: the plows got out early; O: the schools were open; S: it snowed

3.

	A → (¬ B → C)	3
	¬ C	(4)
	A	(3)
3 MPP	¬ B → C	4
4 MTT	B	(5)
	●	
5 QED	B	2
2 CP	A → B	1
1 CP	¬ C → (A → B)	

4.

	A → (¬ B → C)	3
	C	
	A	(3)
3 MPP	¬ B → C	5
	¬ B	(5)
5 MPP	C	
	○	A, ¬ B, C ⊭ ⊥
	⊥	4
4 IP	B	2
2 CP	A → B	1
1 CP	C → (A → B)	

A	B	C	A → (¬ B → C) / C → (A → B)					
T	F	T	Ⓣ	T	T		Ⓕ	F

5. Al is Bob's father and Bob works for him

Al is Bob's father ∧ Bob works for Al

Al = Bob's father ∧ [_ works for _] Bob Al

a = [_'s father] Bob ∧ Wba

a = fb ∧ Wba

W: [_ works for _]; a: Al; b: Bob; f: [_'s father]

6. S Al ([_'s mother] Bob) → ¬ S ([_'s mother] Al) Bob

[_ went to school with _] Al Bob's mother → ¬ [_ went to school with _] Al's mother Bob

Al went to school with Bob's mother → ¬ Al's mother went to school with Bob

Al went to school with Bob's mother → Al's mother didn't go to school with Bob

If Al went to school with Bob's mother, then Al's mother didn't go to school with Bob

7.

	Fa → C	3
	Fb	(4)
	a = b	a-b
	¬ C	(3)
3 MTT	¬ Fa	(4)
	●	
4 Nc=	⊥	2
2 IP	C	1
1 CP	a = b → C	

Phi 270 F00 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

2. Al missed breakfast only if he overslept

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. $A \to (B \to C) \vDash (A \to \neg C) \to (A \to \neg B)$

4. $A \to B \vDash \neg A \wedge B$

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

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. Tabc

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

7. $A \to Ra(fb), Rb(fa) \to Ga \vDash A \to (\neg Gb \to \neg a = b)$

Phi 270 F00 test 3 answers

1. it will rain → you will get wet if you're outside

it will rain → (you will get wet ← you will be outside)

R → (W ← O) [*or:* R → (O → W)]

if R then if O then W

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

2. ¬ Al missed breakfast ← ¬ Al overslept

¬ M ← ¬ O [*or:* ¬ O → ¬ M)]

if not O then not M

M: Al missed breakfast; O:Al overslept

3.

	A → (B → C)	3
	A → ¬ C	4
	A	(3),(4)
3 MPP	B → C	5
4 MPP	¬ C	(5)
5 MTT	¬ B	(6)
	●	
6 QED	¬ B	2
2 CP	A → ¬ B	1
1 CP	(A → ¬ C) → (A → ¬ B)	

4.

	A → B	3,5
	A	(3)
3 MPP	B	
	○	A, B ⊭ ⊥
	⊥	2
2 RAA	¬ A	1
	¬ B	(5)
5 MTT	¬ A	
	○	¬ A, ¬ B ⊭ ⊥
	⊥	4
4 IP	B	1
1 Cnj	¬ A ∧ B	

A	B	A → B	/	¬ A ∧ B	
T	T	T	F	F	divides 1st gap
F	F	T	T	F	divides 2nd gap

5. ¬ Al is the file's owner → the system didn't let Al open the file

¬ Al is the file's owner → ¬ the system let Al open the file

¬ Al = the file's owner → ¬ [_ let _ open _] the system Al the file

¬ a = [_'s owner] the file → ¬ Lsaf

¬ a = of → ¬ Lsaf

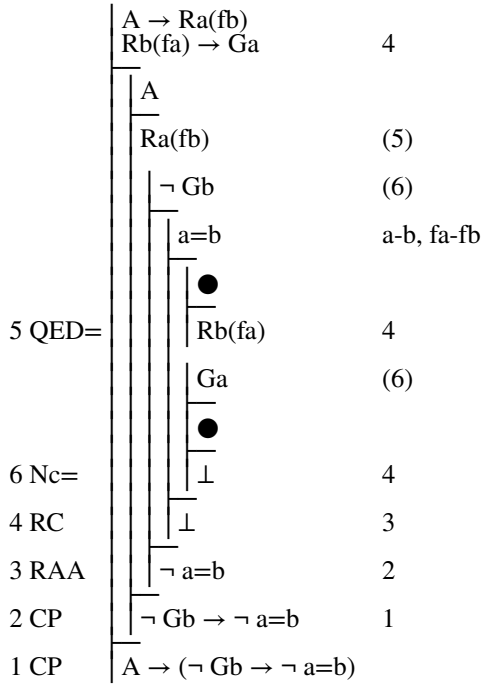
L: [_ let _ open _]; a: Al; f: the file; o: [_'s owner]; s: the system

6. $[Txbc]_x a$

$[Taxc]_x b$

$[Tabx]_x c$

7.



Phi 270 F99 test 3

Analyze the sentences below in as much detail as possible *using connectives*; that is, you need 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. We won't have the material by Thursday unless the order goes in today.

2. If the power went out, they finished the job only if they had a generator.

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. $A \to (\neg B \to C)\ ,\ C \to D \vDash A \to (\neg D \to B)$

4. $(A \wedge B) \to (C \vee D) \vDash A \to C$

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. Adam called Billy's mother and she is the owner of the dog.

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. Rab → Rbc

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

7. $a = fb, Ra(fa) \vDash fb = c \to R(fb)(fc)$

Phi 270 F99 test 3 answers

1. We won't have the material by Thursday unless the order goes in today

we won't have the material by Thursday ← ¬ the order will go in today

¬ we will have the material by Thursday ← ¬ the order will go in today

$$\neg H \leftarrow \neg T \text{ [}or\text{: } \neg T \rightarrow \neg H\text{]}$$

if not T then not H

H: we will have the material by Thursday; T: the order will go in today

2. If the power went out, they finished the job only if they had a generator

the power went out → they finished the job only if they had a generator

the power went out → (¬ they finished the job ← ¬ they had a generator)

$$O \rightarrow (\neg F \leftarrow \neg G) \text{ [}or\text{: } O \rightarrow (\neg G \rightarrow \neg F)\text{]}$$

if O then if not G then not F

F: they finished the job; G:they had a generator; O: the power went out

3.

	$A \rightarrow (\neg B \rightarrow C)$	3
	$C \rightarrow D$	4
	A	(3)
	¬ D	(4)
3 MPP	¬ B → C	5
4 MTT	¬ C	(5)
5 MTT	B	(6)
	●	
6 QED	B	2
2 CP	¬ D → B	1
1 CP	A → (¬ D → B)	

4.

	$(A \wedge B) \rightarrow (C \vee D)$	3
	A	(5)
	¬ C	(8)
	●	
5 QED	A	4
	¬ B	
	○	A, ¬ B, ¬ C ⊭ ⊥
	⊥	6
6 IP	B	4
4 Cnj	A ∧ B	3
	C ∨ D	8
8 MTP	D	
	○	A, ¬ C, D ⊭ ⊥
	⊥	3
3 RC	⊥	2
2 IP	C	1
1 CP	A → C	

A B C D	(A ∧ B) → (C ∨ D) / A → C				
T F F F	F	Ⓣ	F	Ⓕ	divides 1st gap
T F F T	F	Ⓣ	T	Ⓕ	divides both gaps
T T F T	T	Ⓣ	T	Ⓕ	divides 2nd gap

5. Adam called Billy's mother and she is the owner of the dog

Adam called Billy's mother ∧ Billy's mother is the owner of the dog

[_ called _] Adam Billy's mother ∧ Billy's mother = the owner of the dog

Ca(Billy's mother) ∧ Billy's mother = the owner of the dog

Ca([_'s mother] Billy) ∧ [_'s mother] Billy = [the owner of _] the dog

$$Ca(mb) \wedge mb = od$$

C: [_ called _]; a: Adam; b: Billy; d: the dog; m: [_'s mother]; o: [the owner of _]

6. Apart from the choice of the bound variable, the following are all the possibilities:

$[Rxb \rightarrow Rbc]_x a$ $[Rax \rightarrow Rbc]_x b$ $[Rab \rightarrow Rbx]_x c$

$[Rab \rightarrow Rxc]_x b$

$[Rax \rightarrow Rxc]_x b$

7.

	a = fb	a-fb, b, c, fa, fc
	Ra(fa)	(2)
	fb = c	a-fb-c, b, fa-fc
	●	
2 QED=	R(fb)(fc)	1
1 CP	fb = c → R(fb)(fc)	

Phi 270 F98 test 3

(Questions 1-6 are from quiz 3 and 7-10 are from quiz 4 out of 6 quizzes—these two quizzes 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. You may use right-to-left arrows to reflect English word order but you should then also restate your symbolic analysis with arrows running left to right and, in any case, you should restate it using English notation.

1. If our message got there, they should be on their way
2. Unless we make reservations, we'll get a table only if it is a slow night

3. Check the following for validity using derivations; you *may use* attachment rules and detachment rules. If the derivation fails, present a counterexample that divides the premises from the conclusion.

$$\frac{A \rightarrow (B \rightarrow (C \vee D))}{\neg C \rightarrow (A \rightarrow \neg B)}$$

4. [This question was on a topic not covered in F08] Use replacement by equivalence to put the following sentence into disjunctive normal form. Show how you reach your result; you may combine uses of associativity and commutativity with other principles in a single step but there should be no more than one use of De Morgan's laws or distributivity in each step.

$$\neg ((A \vee \neg B) \wedge (C \wedge A))$$

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. (You need not state the result in English notation.)

If Sam is the winner of the trip, then the winner of the grand prize presented it to him

6. Give two different expansions (using predicate abstracts) of the sentence below as a one-place predicate applied to a term:

$$Pb \wedge Rab$$

7. Draw a diagram which presents the same interpretation as the following tables:

range: 1, 2, 3

a	c	g
2	3	2

τ	Fτ
1	T
2	F
3	T

τ	Gτ
1	F
2	T
3	T

R	1	2	3
1	T	F	T
2	T	F	F
3	F	T	T

8. 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.)

fa = b, b = c, Pb, ¬ Pa, Ra(fa), R(fb)(fc), ¬ Rbc

Check each of the arguments below for validity using derivations. You need *not* present counterexamples to gaps that reach dead ends.

9.
fa = c
Rbc
---
a = b → Ra(fa)

10.
Rab ∨ Rcb
a = b ∧ gb = gc

Rbc → Rcb

Phi 270 F98 test 3 answers

1. If our message got there, they should be on their way
our message got there → they should be on their way

M → W

if M then W

M: our message got there; W: they should be on their way

2. ¬ we will make reservations → we'll get a table only if it is a slow night

¬ we will make reservations → (¬ we'll get a table ← ¬ it will be a slow night)

¬ R → (¬ T ← ¬ S) ***or:*** ¬ R → (¬ S → ¬ T)

if not R then if not S then not T

R: we will make reservations; S: it will be a slow night; T: we'll get a table

3.

	A → (B → (C ∨ D))	4
	¬ C	(6)
	A	(4)
	B	(5)
4 MPP	B → (C ∨ D)	5
5 MPP	C ∨ D	6
6 MTP	D	
	○	A, B, ¬ C, D ⊭ ⊥
	⊥	
3 RAA	¬ B	2
2 CP	A → ¬ B	1
1 CP	¬ C → (A → ¬ B)	

A	B	C	D	A → (B → (C v D)) / ¬ C → (A → ¬ B)						
T	T	F	T	Ⓣ		T	T		T	Ⓕ		F	F

4. [This question was on a topic not covered in F08]

¬ ((A ∨ ¬ B) ∧ (C ∧ A))
≃
¬ (A ∨ ¬ B) ∨ ¬ (C ∧ A)
≃
(¬ A ∧ B) ∨ ¬ (C ∧ A)
≃
(¬ A ∧ B) ∨ ¬ C ∨ ¬ A

[However, that problem was a typo;
I had really intended something along these lines:]

¬ ((A ∨ ¬ B) ∨ (C ∧ ¬ A))
≃
¬ (A ∨ ¬ B) ∧ ¬ (C ∧ ¬ A)
≃
(¬ A ∧ B) ∧ ¬ (C ∧ ¬ A)
≃
(¬ A ∧ B) ∧ (¬ C ∨ A)
≃
(¬ A ∧ B ∧ ¬ C) ∨ (¬ A ∧ B ∧ A)

[which could, but need not, be continued as follows:
≃
(¬ A ∧ B ∧ ¬ C) ∨ (¬ A ∧ A)
≃
¬ A ∧ B ∧ ¬ C]

5. If Sam is the winner of the trip, then the winner of the grand prize presented it to him

Sam is the winner of the trip → the winner of the grand prize presented the trip to Sam

s = the winner of the trip → [_ presented _ to _]the winner of the grand prize the trip Sam

s = [the winner of _] the trip → P(the winner of the grand prize)ts

s = nt → P([the winner of _] the grand prize)ts

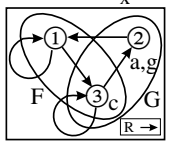
s = nt → P(ng)ts

P: [_ presented _ to _]; g: the grand prize; n: [the winner of _]; s: Sam; t: the trip

6. The following are the possibilities; in the last, τ may be any term:

$[Pb \wedge Rxb]_x a$, $[Px \wedge Rab]_x b$, $[Pb \wedge Rax]_x b$, $[Px \wedge Rax]_x b$, $[Pb \wedge Rab]_x \tau$

7.



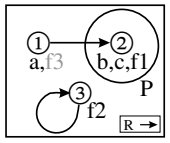
8. range: 1, 2, 3

a	b	c
1	2	2

τ	fτ
1	2
2	3
3	1

τ	Pτ
1	F
2	T
3	F

R	1	2	3
1	F	T	F
2	F	F	F
3	F	F	T



(The diagram above provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.)

alias sets	*IDs*	*values*
a	1	a: 1
fa	2	f1: 2
b		b: 2
c		c: 2
fb	3	f2: 3
fc		f2: 3

resources	*values*
Pb	P2: **T**
¬ Pa	P1: **F**
Ra(fa)	R12: **T**
R(fb)(fc)	R33: **T**
¬ Rbc	R22: **F**

9.

	fa = c	a, b, fa—c, fb
	Rbc	(2)
	a = b	a—b, fa—fb—c
	●	
2 QED=	Ra(fa)	1
1 CP	a = b → Ra(fa)	

10.

	Rab ∨ Rcb	4
	a = b ∧ gb = gc	2
	Rbc	
2 Ext	a = b	a—b,c,gb,gc
2 Ext	gb = gc	a—b,c,gb—gc
	¬ Rcb	(4)
4 MTP	Rab	
	○	a=b,gb=gc,Rbc,¬Rcb,Rab ⊭ ⊥
	⊥	3
3 CP	Rcb	1
1 CP	Rbc → Rcb	

Phi 270 F97 test 3

(Questions 1-6 are from quiz 3 and 7-9 are from quiz 4 out of 6 quizzes—these two quizzes 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.

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

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

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.
$$\frac{A \rightarrow (B \vee C)}{\neg C \rightarrow (A \rightarrow B)}$$

4.
$$\frac{A \rightarrow (B \rightarrow C)}{(C \wedge A) \rightarrow B}$$

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.

6. **a.** Give two different expansions (using predicate abstracts) of the sentence: Raba.

b. Put the following into reduced form: $[Pxa \wedge Qbx]_x a$.

7. 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.)

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

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

8. $Fa \wedge \neg Fb \vDash b = c \rightarrow \neg a = c$

9. $fa = c,\ fb = c,\ Rc(fa) \rightarrow Ra(fa) \vDash R(fa)(fb) \rightarrow Rb(fb)$

Phi 270 F97 test 3 answers

1. the creek will be high enough only if it rains

¬ the creek will be high enough ← ¬ 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

2. ¬ you will object → Al will show the letter to Barb if she asks to see it

¬ you will object → (Al will show the letter to Barb ← 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.

	$A \rightarrow (B \vee C)$	3
	¬ C	(4)
	A	(3)
3 MPP	B ∨ C	4
4 MTP	B	(5)
	●	
5 QED	B	2
2 CP	A → B	1
1 CP	¬ C → (A → B)	

4.

	$A \to (B \to C)$	3
	$C \wedge A$	2
2 Ext	C	
2 Ext	A	(3)
3 MPP	$B \to C$	5
	$\neg B$	
	$\neg B$	
	○	$A,\neg B,C \nvDash \bot$
	$\bot$	6
6 IP	B	5
	C	
	○	$A,\neg B,C \nvDash \bot$
	$\bot$	5
5 RC	$\bot$	4
4 IP	B	1
1 CP	$(C \wedge A) \to B$	

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

5. Dan's wife received the message → Dan's wife is the person who called

[_ received _] Dan's wife the message → Dan's wife = the person who called

R(Dan's wife)m → [_'s wife] Dan = p

R(fd)m → fd = p

R: [_ received _]; d: Dan; f: [_'s wife]; m: the message; p: the person who called

6. **a.** The following are the possibilities; in the last, τ may be any term:

$[Rxbx]_x a$, $[Rxba]_x a$, $[Rabx]_x a$, $[Raxa]_x b$, $[Raba]_x \tau$

b. $Paa \wedge Qba$

7. range: 1, 2, 3

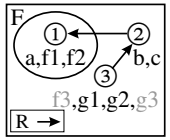
a	b	c
1	2	2

τ	fτ
1	1
2	1
3	3

τ	gτ
1	3
2	3
3	3

τ	Fτ
1	T
2	F
3	F

R	1	2	3
1	F	F	F
2	T	F	F
3	T	T	F



(The diagram provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.)

alias sets	*IDs*	*values*
a	1	a: 1
fa		f1: 1
fb		f2: 1
b	2	b: 2
c		c: 2
gc	3	g2: 3

resources	*values*
Fa	F1: **T**
¬ F(gc)	F3: **F**
Rb(fa)	R21: **T**
¬ Ra(fb)	R11: **F**
R(gc)c	R32: **T**

8.

	$Fa \wedge \neg Fb$	1
1 Ext	Fa	(4)
1 Ext	$\neg Fb$	(4)
	$b = c$	a,b-c
	$a = c$	a-b-c
	●	
4 Nc=	$\bot$	3
3 RAA	$\neg a = c$	2
2 CP	$b = c \to \neg a = c$	

9.

	$fa = c$	
	$fb = c$	a,b,c-fa-fb
	$Rc(fa) \to Ra(fa)$	3
	$R(fa)(fb)$	(4)
	$\neg Rb(fb)$	
	●	
4 QED=	$Rc(fa)$	3
	$Ra(fa)$	
	○	fa=c,fb=c,R(fa)(fb),¬Rb(fb),Ra(fa) ⊭ ⊥
	$\bot$	3
3 RC	$\bot$	2
2 IP	$Rb(fb)$	1
1 CP	$R(fa)(fb) \to Rb(fb)$	

Phi 270 F96 test 3

(Questions 1-6 are from quiz 3 and 7-9 are from quiz 4 out of 6 quizzes—these two quizzes 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.

1. You won't succeed unless you try.

2. If it was after 5, Sam got in only if he had a key.

Check each of the following claims of entailment 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. $(A \wedge B) \rightarrow C \vDash A \rightarrow C$

4. $C \rightarrow (A \rightarrow B) \vDash (A \wedge \neg B) \rightarrow \neg C$

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 Ann's car is the one you saw, she wasn't driving it.

6. **a.** Give two different expansions (using predicate abstracts) of the reduced form: Raa.

b. Put the following into reduced form: $[Fx \wedge Pxb]_x c$.

7. 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, where possible, using diagrams.)

$a = c$, $ga = gb$, Pa, $\neg P(ga)$, Rab, Rbc, $\neg Rc(ga)$

Check each of the claims of entailment below using derivations. You need *not* describe structures dividing gaps you leave open.

8. $Ha \wedge c = d, G(fd) \vDash G(fc) \wedge (a = b \rightarrow Hb)$

9. $Ra(fa) \wedge Rb(fb), fa = b \vDash Ra(f(fa))$

Phi 270 F96 test 3 answers

1. You won't succeed unless you try

you won't succeed ← ¬ you will try

¬ you will succeed ← ¬ you will try

$\neg S \leftarrow \neg T$ ***or*** $\neg T \rightarrow \neg S$

if not T then not S

S: you will succeed; T: you will try

2. If it was after 5, Sam got in only if he had a key

it was after 5 → Sam got in only if he had a key

it was after 5 → (¬ Sam got in ← ¬ Sam had a key)

$A \rightarrow (\neg G \leftarrow \neg K)$ ***or*** $A \rightarrow (\neg K \rightarrow \neg G)$

if A then if not K then not G

A: it was after 5; G: Sam got in; K: Sam had a key

3.

	$(A \wedge B) \rightarrow C$	3
	A	(4)
	¬ C	(3)
3 MTT	¬ (A ∧ B)	4
4 MPT	¬ B	
	○	A,¬ B,¬ C ⊭ ⊥
	⊥	2
2 IP	C	1
1 CP	A → C	

A	B	C	(A ∧ B) → C / A → C
T	F	F	F Ⓣ Ⓕ

4.

	$C \rightarrow (A \rightarrow B)$	4
	$A \wedge \neg B$	2
2 Ext	A	(5)
2 Ext	$\neg B$	(6)
	C	(4)
4 MPP	$A \rightarrow B$	5
5 MPP	B	(6)
	●	
6 Nc	$\perp$	3
3 RAA	$\neg C$	1
1 CP	$(A \wedge \neg B) \rightarrow \neg C$	

5. If Ann's car is the one you saw, she wasn't driving it

Ann's car is the one you saw → ¬ Ann was driving Ann's car

Ann's car = the car you saw → ¬ [_ was driving _] Ann (Ann's car)

[_'s car] Ann = [the car _ saw] you → ¬ Da([_'s car] Ann)

ca = ro → ¬ Da(ca)

[ca = ro → ¬ Da(ro) is also possible]

D: [_ was driving _]; a: Ann; c: [_'s car]; o: you; r: [the car _ saw]

6. **a.** The following are the possibilities; in the last, τ may be any term:

$[Rxx]_x a$, $[Rxa]_x a$, $[Rax]_x a$, $[Raa]_x \tau$

b. Fc ∧ Pcb

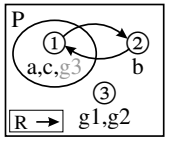
7. range: 1, 2, 3

a	b	c
1	2	1

τ	gτ
1	3
2	3
3	1

τ	Pτ
1	T
2	F
3	F

R	1	2	3
1	F	T	F
2	T	F	F
3	F	F	F



(The diagram provides a complete answer, and so do the tables to its left. The tables below show a way of arriving at these answers.)

alias sets	*IDs*	*values*
a	1	a: 1
c		c: 1
b	2	b: 2
ga	3	g1: 3
gb		g2: 3

resources	*values*
Pa	P1: **T**
¬ P(ga)	P3: **F**
Rab	R12: **T**
Rbc	R21: **T**
¬ Rc(ga)	R13: **F**

8.

	$Ha \wedge c = d$	
	G(fd)	(3)
1 Ext	Ha	(5)
1 Ext	c = d	a,b,c-d,fc-fd
	●	
3 QED=	G(fc)	2
	a = b	a-b,c-d,fc-fd
	●	
5 QED=	Hb	4
4 CP	a = b → Hb	2
2 Cnj	G(fc) ∧ (a = b → Hb)	

9.

	Ra(fa) ∧ Rb(fb)	1
	fa = b	a,b-fa,fb-f(fa)
1 Ext	Ra(fa)	
1 Ext	Rb(fb)	
	¬ Ra(f(fa))	
	○	fa=b,Ra(fa),Rb(fb),¬Ra(f(fa)) ⊭ ⊥
	⊥	2
2 IP	Ra(f(fa))	