Midterm Exam Answers

[Logic I: Rabern]

0. P: Alfred loves contradictions.

$$(P \rightarrow (P \wedge \sim P))$$

1. P: Jane attends the party
Q: Frank attends the party.
R: Alfred attends the party.

$$(P \rightarrow (R \rightarrow \sim Q))$$

2. P: Frank buys wine.
Q: Adi buys cheese.

$$((P \wedge Q) \vee \sim P)$$

3. P: Descartes can doubt that he is thinking.
Q: Descartes thinks.
R: Descartes exists.

$$(P \rightarrow Q) . (\sim P \rightarrow Q) . (\sim R \rightarrow \sim Q) \therefore R$$

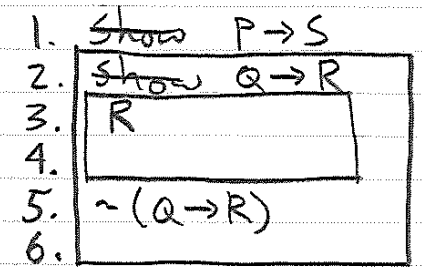
4. $(\sim R \to \sim W) . (R \to \sim W) \therefore \sim W$

1.	~~show~~ $\sim W$	
2.	$\sim\sim W$	ass id
3.	$\sim R \to \sim W$	pr1
4.	$R \to \sim W$	pr2
5.	$\sim\sim R$	2, 3, mt
6.	$\sim R$	2, 4, mt
7.		5, 6, id

5. $Z \to (Q \to R) . Z \to (R \to P) \therefore Z \to (Q \to P)$

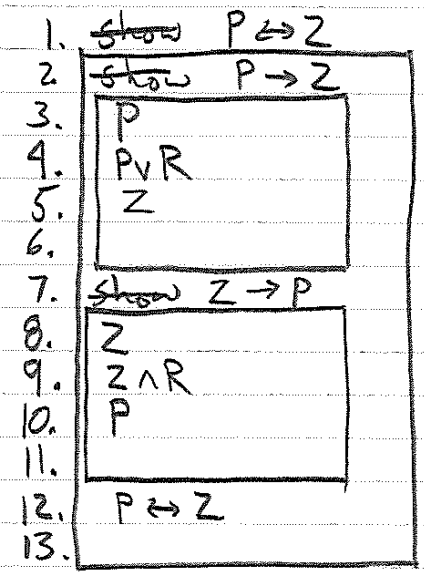
1.	~~show~~ $Z \to (Q \to P)$	
2.	Z	ass cd
3.	~~show~~ $Q \to P$	
4.	Q	ass cd
5.	~~show~~ P	
6.	$\sim P$	ass id
7.	$Q \to R$	2, pr1, mp
8.	$R \to P$	2, pr2, mp
9.	R	4, 7, mp
10.	P	8, 9, mp
11.		6, 10, id
12.		5, cd
13.		3, cd

6. $\sim(Q \to R)$. $(R \wedge (\sim W \vee S))$ $\therefore$ $(P \to S)$



pr 2, s
3, cd
pr 1
2, 5, id

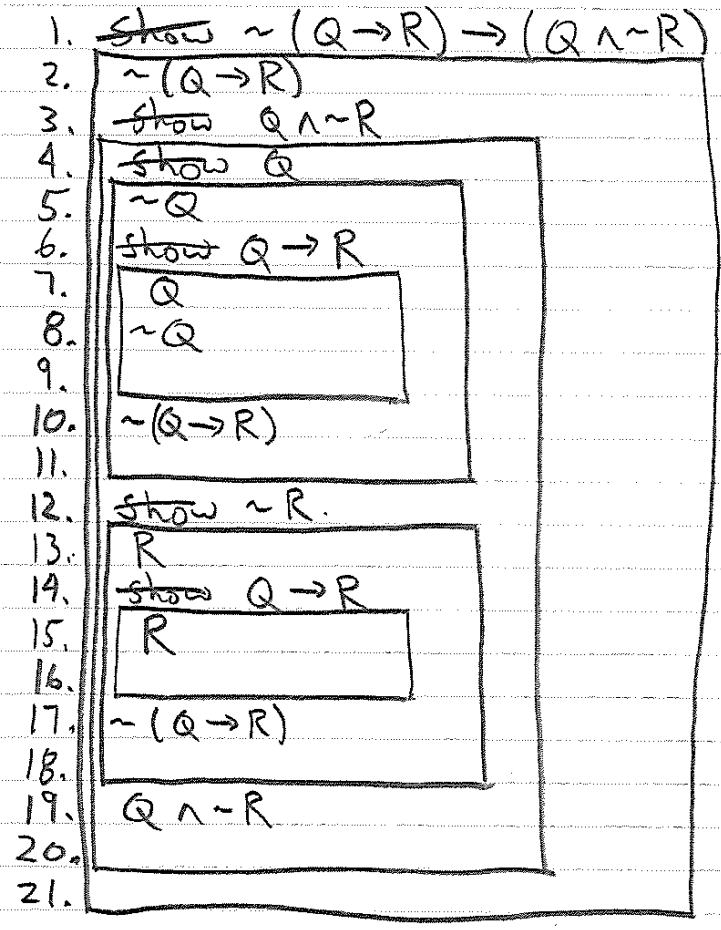
7. $(Z \wedge R) \to P$. $(P \vee R) \to Z$. R $\therefore$ $P \leftrightarrow Z$



ass cd
3, add
4, pr 2, mp
5, cd

ass cd
8, pr 3, adj
9, pr 1, mp
10, cd
2, 7, cb
12, dd

8. $\therefore \sim(Q \to R) \to (Q \wedge \sim R)$



ass cd

ass id

ass cd

5, r

7, 8, id

2, r

6, 10, id

ass id

13, r

15, cd

2, r

14, 17, id

4, 12, adj

19, dd

3, cd

9. $\sim(P \leftrightarrow Q)$

P	Q	$P \oplus Q$	$\sim(P \leftrightarrow Q)$	
T	T	F	F	T
T	F	T	T	F
F	T	T	T	F
F	F	F	F	T

10. Note that this puzzle is commonly known as "the hardest logic puzzle ever". If you solved it, that is great. If you didn't, don't worry about it. The puzzle originally occurs in Boolos (1996). "The hardest logic puzzle ever". The Harvard Review of Philosophy 6: 62–65.

Solution:

Question 1: Ask god B, "If I asked you 'Is A Random?', would you say 'ja'?". If B answers 'ja', either B is Random (and is answering randomly), or B is not Random and the answer indicates that A is indeed Random. Either way, C is not Random. If B answers 'da', either B is Random (and is answering randomly), or B is not Random and the answer indicates that A is not Random. Either way, you know that a particular god is not Random.

Question 2: Go to the god who was identified as not being Random by the previous question (either A or C), and ask him: "If I asked you 'Are you False?', would you say 'ja'?". Since he is not Random, an answer of 'da' indicates that he is True and an answer of 'ja' indicates that he is False.

Question 3: Ask the same god the question: "If I asked you 'Is B Random?', would you say 'ja'?". If the answer is 'ja', B is Random; if the answer is 'da', the god you have not yet spoken to is Random. The remaining god can, then, be identified by elimination.

[This solution is based off of a solution provided in "A simple solution to the hardest logic puzzle ever" [B. Rabern & L. Rabern] (2008), Analysis 68(298): 105–112.]