

Intermediate Logic

Homework #27
(Due: 4/30/2013)

Read pages 117-124 in the *Intermediate Logic* text and complete the exercises.

Exercise 28 (p. 118)

1. Write a formal proof of validity for the following Destructive Dilemma. This can be done in two additional steps.

1. $(P \supset Q) \bullet (R \supset S)$

2. $\sim Q \vee \sim S \quad / \therefore \sim P \vee \sim R$

3. _____

4. _____

2. Invent and name your own rule of inference (make sure it's valid!). Then use that rule to solve a proof from a previous exercise in fewer steps than it was previously solved. Include the exercise & problem numbers as well as both proofs for comparison.

Name of rule:

Form:

Demonstration from Exercise _____, problem # _____ (Use only the number of blanks you need below.)

1. _____

1. _____

2. _____

2. _____

3. _____

3. _____

4. _____

4. _____

5. _____

5. _____

6. _____

6. _____

7. _____

7. _____

8. _____

8. _____

9. _____

9. _____

Show the following rules of inference to be unnecessary by writing formal proofs of validity for them without using those rules anywhere in your proofs. You may use any of the other rules of inference, the rules of replacement, the Conditional proof, and Reductio ad Absurdum.

3. Modus Tollens

1. $P \supset Q$
2. $\sim Q / \therefore \sim P$
3. _____
4. _____

5. Hypothetical Syllogism

1. $P \supset Q$
2. $Q \supset R / \therefore P \supset R$
3. _____
4. _____
5. _____
6. _____

7. Addition

1. $P / \therefore P \vee Q$
2. _____
3. _____
4. _____
5. _____
6. _____

4. Absorption

1. $P \supset Q / \therefore P \supset (P \bullet Q)$
2. _____
3. _____
4. _____
5. _____

6. Disjunctive Syllogism

1. $P \vee Q$
2. $\sim P / \therefore Q$
3. _____
4. _____
5. _____

(The "Challenge" is optional for extra credit. It is on the last page.)

Exercise 29 (page 124)

Demonstrate that negation and conjunction together form a truth-functionally complete set. Use the numbers given in the text (p. 124) to write your answers below.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

(The “Challenge” is optional for extra credit. It is on the last page.)

Cranium Calisthenics

The Lady or the Tiger?* - (The Eleventh Trial) In this more whimsical trial, the king explained to the prisoner that one of the three rooms contained a lady, another a tiger, and the third room was empty. The sign on the door of the room containing a lady was true, the sign on the door of the room with the tiger was false, and the sign on the door of the empty room could be either true or false. Here are the three signs:

I
ROOM III
IS EMPTY

II
THE TIGER IS
IN ROOM I

III
THIS ROOM
IS EMPTY

Now the prisoner happened to know the lady in question and wished to marry her. Therefore, although the empty room was preferable to the one with the tiger, his first choice was the room with the lady. Which room contains the lady, and which room contains the tiger? If you can answer these two questions, you should have little difficulty in also determining which room is empty. (Remember to explain your answer!)



* *The Lady or the Tiger? And Other Logic Puzzles*, by Raymond Smullyan. Random House, Inc. 1982.

Optional Exercises For Extra Credit

Exercise 28 Challenge (from page 118)

Constructive Dilemma

1. $(P \supset Q) \bullet (R \supset S)$

2. $P \vee R / \therefore Q \vee S$

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____



Exercise 29 Challenge (from page 124)

Develop a conditional proposition $p \supset q$ using only NOR.