

Homework 8

Assigned on: Fri April 7, 2006.

Due: Mon Apr 17, 2006.

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1	Truth Tables	8 points	1
2	AIMA, Exercise 7.2, page 236.	16 points	1
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6	AIMA, Exercise 7.11, page 238.	18 points + 20 bonus	3

This is a pen-and-paper homework, to be returned in class
 The whole homework is worth 95 points

1 Truth Tables 8 points

Use truth tables to show that each of the following is a tautology.

1. $(p \wedge q) \rightarrow \neg(\neg p \vee \neg q)$
2. $[Mary \wedge (Mary \rightarrow Susy)] \rightarrow Susy$
3. $\alpha \rightarrow [\beta \rightarrow (\alpha \wedge \beta)]$
4. $(a \rightarrow b) \rightarrow [(b \rightarrow c) \rightarrow (a \rightarrow c)]$

2 AIMA, Exercise 7.2, page 236. 16 points

3 AIMA, Exercise 7.8, page 237. 16 points

only c, d, e, f, g and h.

4 Logical Equivalences

8 points

Using a method of your choice, verify:

1. $(\alpha \rightarrow \beta) \equiv (\neg\beta \rightarrow \neg\alpha)$ contraposition
2. $\neg(\alpha \wedge \beta) \equiv (\neg\alpha \vee \neg\beta)$ de Morgan
3. $(\alpha \wedge (\beta \vee \gamma)) \equiv ((\alpha \wedge \beta) \vee (\alpha \wedge \gamma))$ distributivity of \wedge over \vee

5 Proofs

29 points

Give the explanations of each step if the steps are given, and give both the explanation and step if they are not.

- If $q \wedge (r \wedge p), t \rightarrow v, v \rightarrow \neg p$, then $\neg t \wedge r$.

Proof

Explanations

- | | |
|----------------------------|-------|
| 1. $q \wedge (r \wedge p)$ | Given |
| 2. $t \rightarrow v$ | Given |
| 3. $v \rightarrow \neg p$ | Given |
| 4. $t \rightarrow \neg p$ | |
| 5. $(r \wedge p)$ | |
| 6. r | |
| 7. p | |
| 8. $\neg\neg p$ | |
| 9. $\neg t$ | |
| 10. $\neg t \wedge r$ | |

- If $p \rightarrow (q \wedge r), q \rightarrow s$, and $r \rightarrow t$, then $p \rightarrow (s \wedge t)$.

Proof

Explanations

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

• **Prove by contradiction.**

If $\neg(\neg p \wedge q), p \rightarrow (\neg t \vee r), q$, and t , then r .

Proof

Explanations

1. $\neg(\neg p \wedge q)$	Given
2. $p \rightarrow (\neg t \vee r)$	Given
3. q	Given
4. t	Given
5. $\neg r$	Negation of Conclusion
6.	
7.	
8.	
9.	
10.	
11.	
12.	

6 AIMA, Exercise 7.11, page 238. 18 points + 20 bonus

Parts a, b, and c are required. Parts d, e, and f are bonus.