

Tutorial Week 3

1. Prove b using a formal propositional logic proof given the five numbered premises below:

(a) $(\sim p \vee q) \rightarrow p$

(b) $\sim r \rightarrow \sim p$

(c) $\sim (r \wedge \sim a)$

(d) $(\sim a \vee b)$

(e) $(q \vee s) \rightarrow t$

6. $\sim(\sim p \vee \sim q) \vee p$ by 1 and Implication Equiv.

7. $(p \wedge \sim q) \vee p$ by 6 and De Morgan's

8. p by 7 absorption

Solution 9. r by 2, 8 and modus tollens

10. $\sim r \vee a$ by 3 and De Morgan's

11. a by 9, 10 and elimination

12. b by 4, 11 and elimination

2. An elementary school teacher with amazing (and bizarre) powers of observation noticed the following facts, while his students were having lunch:

- Paul and Ursula did not both eat sandwiches.
- If Samuel forgot to bring his lunch, then either Paul ate a sandwich, or Quentin did not eat an orange (or both).
- Ursula ate a sandwich.
- If Trish forgot to eat her banana and Paul did not eat a sandwich, then Samuel forgot to bring his lunch.
- If Paul did not eat a sandwich, then Quentin ate an orange.

The teacher thinks that Trish did not forget to eat her banana, but he is not certain.

a) Name each simple proposition above, e.g.: t: Trish forgot to eat her banana.

p: Paul ate a sandwich for lunch.
u: Ursula ate a sandwich for lunch.
s: Samuel forgot to bring his lunch.
q: Samuel forgot to bring his lunch.
t: Trish forgot to eat her banana.

Solution:

b) Rewrite the bulleted statements using propositional logic and your propositions from the previous part.

1. $\sim(p \wedge u)$
2. $s \rightarrow (p \vee \sim q)$
3. u
4. $(t \wedge \sim p) \rightarrow s$
5. $\sim p \rightarrow q$

Solution:

c) Using your statements in the previous part as premises, prove that Trish did not forget to eat her banana. Be sure to list and number your steps and to give a justification for each step, citing the previous step(s) it depends on.

6. $\sim p \vee \sim u$ by 1 and De Morgan's
7. $\sim p$ by 3, 6 and eliminations
8. q by 5, 7 and modus ponens
9. $\sim p \wedge q$ by 7, 8 and conjunction
10. $\sim(p \vee \sim q)$ by 9 and De Morgan's
11. $\sim s$ by 2, 10 and modus tollens
12. $\sim(t \wedge \sim p)$ by 4, 11 and modus tollens
13. $\sim t \vee p$ by 4, 12 and De Morgan's
14. $\sim t$ by 7, 12 and elimination

Extra Practice:

Sussanna Epp 4th edition: 2.3, #37, 39, 41, 43 (Solutions are at the back of the textbook)