

CPSC 121 - PROPOSITIONAL LOGIC PROOFS

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

- [1] $\sim p \vee q \rightarrow p$
- [2] $\sim r \rightarrow \sim p$
- [3] $\sim (r \wedge \sim a)$
- [4] $\sim a \vee b$
- [5] $q \vee s \rightarrow t$

Problem 2. Decide whether the following argument is valid or not. If you think it is invalid, provide a truth value assignment that proves your claim. Otherwise provide a proof for it.

- [1] $p \rightarrow q$
 - [2] $m \vee s$
 - [3] $\sim s \rightarrow \sim r$
 - [4] $\sim q \vee s$
 - [5] $\sim s$
 - [6] $\sim p \wedge m \rightarrow u$
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- $\therefore \sim u$

Problem 3. Steve has bizarre powers of observation, and noticed the following facts during a staff meeting, while the TAs were nibbling on their food:

- Adam and Winnie did not both eat sandwiches.
- If Thiabaud forgot to bring his lunch, then either Adam ate a sandwich, or Yves did not eat an orange (or both).
- Winnie ate a sandwich.
- If Cindy forgot to eat her banana and Adam did not eat a sandwich, then Thiabaud forgot to bring his lunch.
- If Adam did not eat a sandwich then Yves ate an orange.

Steve thinks that Cindy did not forget to eat her banana, but he is not certain.

- (1) Name each simple proposition above, e.g.: t:Thiabaud forgot to bring his lunch.
- (2) Rewrite the bulleted statements using propositional logic and your propositions from the previous part.
- (3) Using your statements in the previous part as premises, prove that Cindy 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.