Murder Mystery!
+ True/False

November 12, 2013

Part I True/False.

(a) Adding a premise to a valid argument can render the argument invalid.

(b) If φ implies θ and ψ implies θ, then $\ulcorner \varphi \vee \psi \urcorner$ implies θ.

(c) If φ implies $\ulcorner \psi \supset \theta \urcorner$, then ψ implies $\ulcorner \varphi \supset \theta \urcorner$.

(d) The sentence $\ulcorner (\forall x)\varphi^x \urcorner$ is equivalent to a conjunction of all sentences of the form φ^τ, where τ is a term.

(e) If a disjunction is valid, then one of the disjuncts must be valid.

(f) If a conditional is unsatisfiable, then the antecedent is valid.

Part II Here's what we know about Henry's murder:

> The murderer was either the butler, the maid, or the cook. Henry's murderer(s) used only one weapon, but not one they owned of course. The butler and the maid were married, so they owned the same things. Sadly, someone was murdered by everyone who didn't commit suicide (i.e. murder themselves). And no one who did commit suicide murdered Henry or the maid.

   Which of the following is implied by the information above? If it's implied, prove it using a truth tree. If it's not, briefly explain why.

(a) Some weapon was used by some murderer.

(b) If one of the weapons used was the maid's, the cook did it.

(c) If the cook did it, he used one of the maid's weapons.

(d) Henry most definitely didn't commit suicide, but someone did.

(e) The murderer(s) didn't use the cook's knife.

(f) The maid murdered someone.