

Sample exam problems

These are some example problems from old exams. This isn't a complete exam; it only contains some of the kinds of problems I'll include. It leaves out definition type problems (e.g., define what "soundness" means, define what a "model" is, etc.), since I don't have as many of those that I like, so I don't want to give them away!

1. Axiomatic proof: Here are the steps of an axiomatic proof, out of order. You must put them in order and fill in the annotations: ... [deleted]
2. State the rule MP (Modus ponens). Show, in a couple sentences, that modus ponens is *truth-preserving* – i.e., that in any valuation, V , if the premises of modus ponens are true, then the conclusion must be true as well.
3. Translate $R \vee (P \leftrightarrow (Q \rightarrow \sim(P \& S)))$ into polish notation.
4. Translate $P \vee Q$ using just the Sheffer stroke.
5. Supposing that P and Q are 1 and R is #, what truth value does the following formula have, under the i) Łukasiewicz tables, ii) the Kleene tables, and iii) the Bochvar tables:

$$(P \vee Q) \rightarrow \sim(R \rightarrow P)$$

6. Show that $\models \forall x(Fx \& Gx) \rightarrow \forall x Fx$
7. Show that $\not\models \forall x(Fx \rightarrow \exists y Rxy) \rightarrow \exists y \forall x(Fx \rightarrow Rxy)$
8. Show that $\{ \forall x(Fx \rightarrow Gx), \exists x Fx, \forall x(Fx \rightarrow Fh(x)) \} \not\models \forall x(Gx \rightarrow Gh(x))$
9. Symbolize the following sentences. You may use $=$, function symbols, and the ι :
 - a. Everyone who hates his father hates himself
 - b. If the square of a number is even, then the sum of that¹ number and its square is even.
 - c. Everyone respects someone else.
 - d. The dog that bit two cats has rabies.
10. Symbolize d from problem 9 using Russell's theory of descriptions.

¹ I mean the original number; not its square.