

Problem Set 9

Due Friday, November 8th by 5pm

(20 points per question. Please scan and upload to Canvas as a PDF)

If you worked with up to two classmates, please list their names.

Note: Complete the following steps for two of the following three problems given below:

- (I) Regiment the argument in $\mathcal{L}^=$. (5pts)
- (II) State whether the argument is valid or invalid. (5pts)
- (III) If the argument is invalid, provide a countermodel along with a semantic argument that proves that the argument is invalid. If the argument is valid, provide a semantic argument that proves that it is valid. (10pts)

1. Hesperus is rising. Hesperus is Phosphorus. Therefore Phosphorus is rising.

Proof

(I)

Rx : x is rising

Hesperus = h

Phosphorus = p

Rh

$h = p$

Rp

(II) Argument is valid

(III) Proof:

1. Let $M = \{\mathbf{D}, I\}$ be a \mathcal{L}^{FOL} model where $V_I(h = p) = 1$ and $V_I(Rh) = 1$.

2. It follows by Lemma 9.2 that $V_I^{\hat{a}}(Rh) = 1$ and $V_I^{\hat{a}}(h = p) = 1$

2. If the king of France is bald, then there is a king of France. But there is no king of France. Therefore the king of France is not bald.
3. Alcibiades and Credo both love Socrates. Therefore Socrates has at least two lovers.

Proof

(I)

Lxy : x loves y

Alcibiades = a

Credo = c

Socrates = s

$Las \wedge Lcs$

$(\exists x)(\exists y)((Lxs \wedge Lys) \wedge \neg x = y)$

(II) Argument is valid

(III) Proof:

Hints: Remember...

1. Officially the extension of 1-place predicates is a set of 1-tuples.
2. Your semantic proofs ought to appeal to the semantic clauses. Avoid skipping steps in your semantic proofs.