

Subject 24.241. Logic I. Homework due in LEC #11

I. Use Venn diagrams to show the following arguments are valid:

1. All dinosaurs are reptiles.
Not all dinosaurs are cold-blooded.
Therefore, not all reptiles are cold-blooded.
2. All Greek philosophers are wise.
Heidegger was a philosopher, but he wasn't wise.
Therefore, Heidegger wasn't Greek.
3. Every philosopher has a beard.
No trapeze artist has a beard.
The Splendid Seigfreid is a trapeze artist.
Therefore, the Splendid Seigfreid is no philosopher.

II For the following ten questions, consider the interpretation A with

$$\begin{aligned} |A| &= \{\text{natural numbers } \leq 10\} = \{0,1,2,3,4,5,6,7,8,9,10\} \\ A("o") &= 1 \\ A("t") &= 2 \\ A("E") &= \{\text{even natural numbers } \leq 10\} = \{0,2,4,6,8,10\} \\ A("P") &= \{\text{prime numbers } \leq 10\} = \{2,3,5,7\} \\ A("S") &= \{\text{natural numbers } \leq 3\} = \{0,1,2,3\} \end{aligned}$$

1. Which numbers satisfy " $\neg Ex$ "?
2. Which numbers satisfy " $(Px \dot{\cup} Ex)$ "?
3. Which numbers satisfy " $(Px \otimes Ex)$ "?
4. Which numbers satisfy " $(Et \dot{\cup} Sx)$ "?
5. Which numbers satisfy " $(\neg Eo \ll \neg(Sx \dot{\cup} Px))$ "?
6. Which numbers satisfy " $(\S x)(Px \dot{\cup} Ex)$ "?
7. Which numbers satisfy " $(\S x)(Ex \otimes \neg Ex)$ "?
8. Which numbers satisfy " $((\S x)(Ex \otimes \neg Ex) \otimes Px)$ "?
9. Give a formula satisfied by 4, 6, 8, and 10, and by no other numbers.
10. Give a formula satisfied by 0, 1, 2, 3, 5, and 7, and by no other numbers.

III Give a list of sixteen sentences such that every sentence containing just the predicate "P" and the individual constant "c" is logically equivalent to a sentence on the list.