5.10-6.2 Questions

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1 5.10, p.153

Thm 5.10.2 Correct me if I'm wrong. *BaseCaseSet* is the set of strings (terms, formulas, expressions?) used in the first steps of a recursive definition (for instance, the atomic formulas) which are then used to define the recursive part of the definition (e.g., $\neg\alpha, \alpha \vee \beta$, and $(\forall x)\alpha$), and then BASECASESET is the set of Gödel numbers of those strings. HETZEL: That is the way I would see it.

2 5.11, p.156

p.158, top of page It's a bit confusing that they use x for two different things here. It would make more sense to me to write E1 as $v = v$ for each variable v, and then suppose $\ulcorner v \urcorner = x$. Then,

$$\begin{aligned} \ulcorner v = v \urcorner &= \langle 7, \ulcorner v \urcorner, \ulcorner v \urcorner \rangle \\ &= \langle 7, x, x \rangle \\ &= 2^8 3^{x+1} 5^{x+1} \\ &= 2^8 3^{Sx} 5^{Sx}. \end{aligned}$$

The way they have it in the book initially made me think of the exponents of 3^{Sx} and 5^{Sx} as S applied to a variable, but then these exponents wouldn't be natural numbers.HETZEL: In effect, Sx is S applied to the variable x, for the equation $x = x$ needs to hold for all variables x. Behind the scenes, though,we understand that x may only take on natural numbered values, as that is our context.

3 5.12, p.158

I didn't mark any questions for section 5.12.

4 6.2, p.171

p.171 (iii) Could you reiterate the meaning of "$\vdash [(\forall i < y)[\neg R(\overline{a}, i)] \to \cdots$", where the $\vdash$ has nothing on the left? I'm thinking it means that that formula is provable in every $\mathcal{L}$-structure, in comparison with their definition of "$\vDash \phi$" from Definition 1.9.2 on p.37, but it has been a while since I last saw this. HETZEL: here, if you write $\vdash A \to B$, this means $N \cup \{A\} \vdash B$, where N is the set of nonlogical axioms for number theory.

5 Random, probably dumb question

In reading about these mathematical languages and the analysis of them, I can't help but think about how they're subliminally used elsewhere. Surely if a physicist happens to say $1 + 1 = 2$ or $\frac{dv}{dt}$ in their work, they're merely using the same machinery of $\mathcal{L}_{NT}/\mathfrak{N}$ or the language of Calculus behind the scenes. Or, when a chemist does molecular geometry, surely they must be using the same old geometry from some language of geometry $\mathcal{L}_{Geo}$, though they may not realize it. Would it be possibly (but perhaps not practical at all) to lump a bunch of languages together into some sort of composite language for subject such as Physics as

$$\mathcal{L}_{Ph} \text{ is } \mathcal{L}_{NT} \cup \mathcal{L}_{Calc} \cup \mathcal{L}_{Geo} \cup \text{ (a bunch of other stuff physics uses)?}$$

HETZEL: Maybe. The issue as I see it is that any subject is an ever-growing organism. As such, do you think it would ever be possible to say that we could stop at some point with our list of languages and confidently declare that a subject can be completely described with respect to those languages?