First-Order Logic = FOL = $\mathscr{L}_1$, Part 2

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Intro to Logic-based AI
10/6/2025

Logic-&-AI In The News (2024)

Ambulance Chasing and AI

Wouldn't the wiser, more humane course be to regulate before a catastrophe?

The language program developed by OpenAI uses artificial intelligence to write a random binary code, Aug. 7. (PHOTO: FRANK RUMPENHORST/ZUMA PRESS)

Oct 02, 2024 10:40 a.m. ET

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Under Ketan Ramakrishnan's preferred means of regulating artificial intelligence ("Tort Law Is the Best Way to Regulate AI," op-ed, Sept. 25), "bioterrorist attacks or other grievous harm" are prerequisites to action. As he concedes, tort law purports to compensate the damaged after the damage has already occurred.

Sadly, the only ones truly compensated are the tort lawyers. Wouldn't the wiser, more humane course be to regulate before a catastrophe? If he knows, as he claims, that a company has already "released a powerful new artificial-intelligence model this month that modestly but meaningfully increases the risk of catastrophic bioterrorism," why wait for catastrophe? That's rather coldblooded, as if one is after the contingency fee.

Christopher C. Spencer

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You're right! We'll get to the engineering into AI's ethical/legal control later in the course.

Logic-&-AI In The News (2025)

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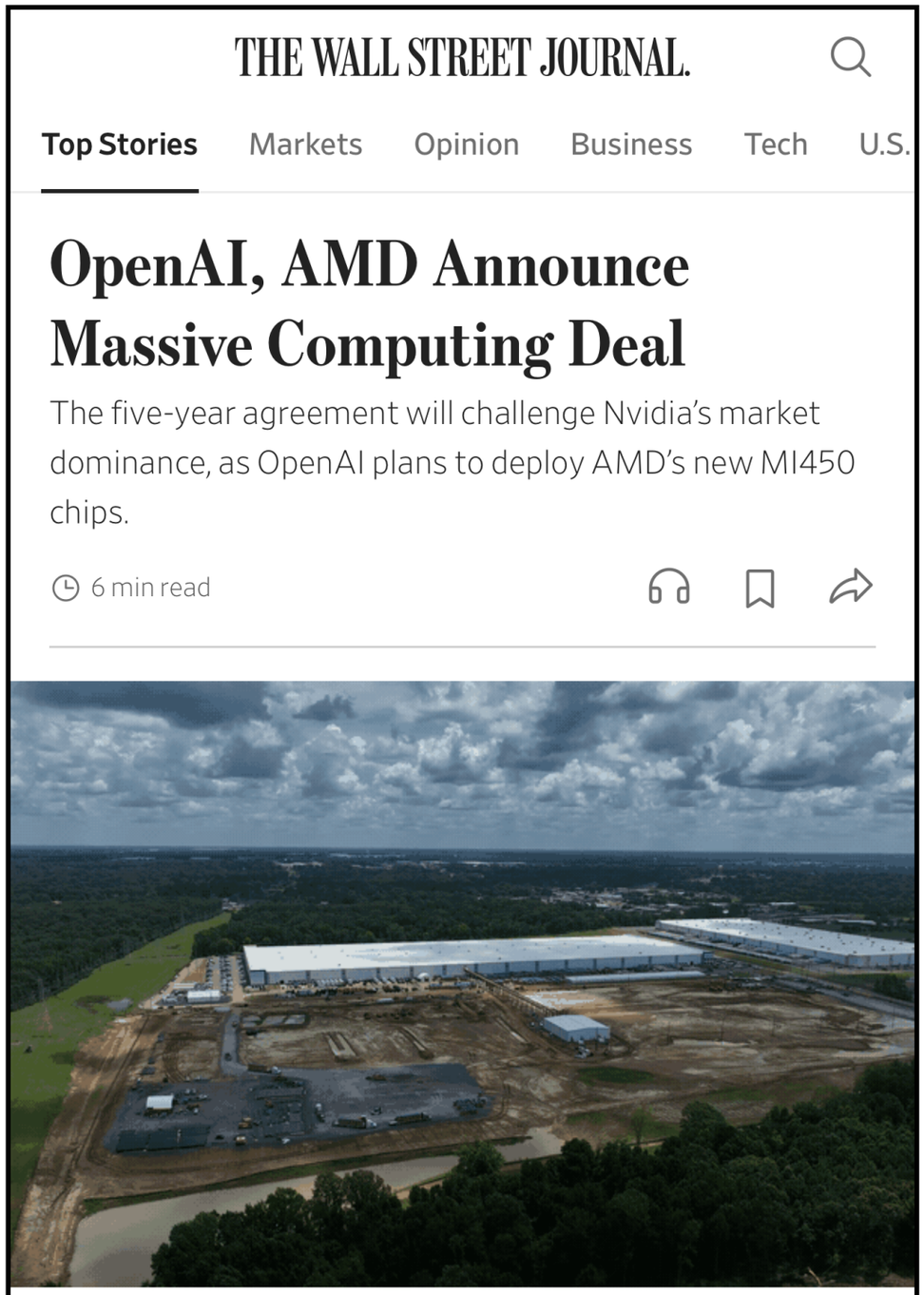

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OpenAI, AMD Announce Massive Computing Deal

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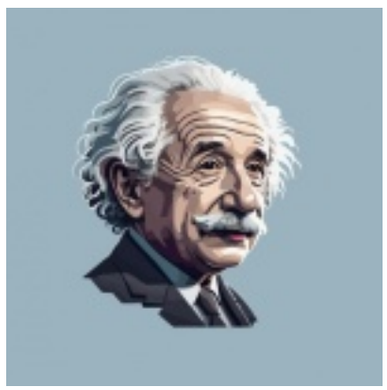

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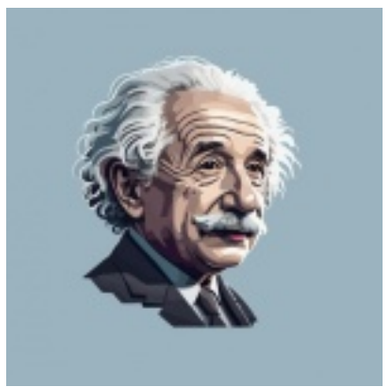

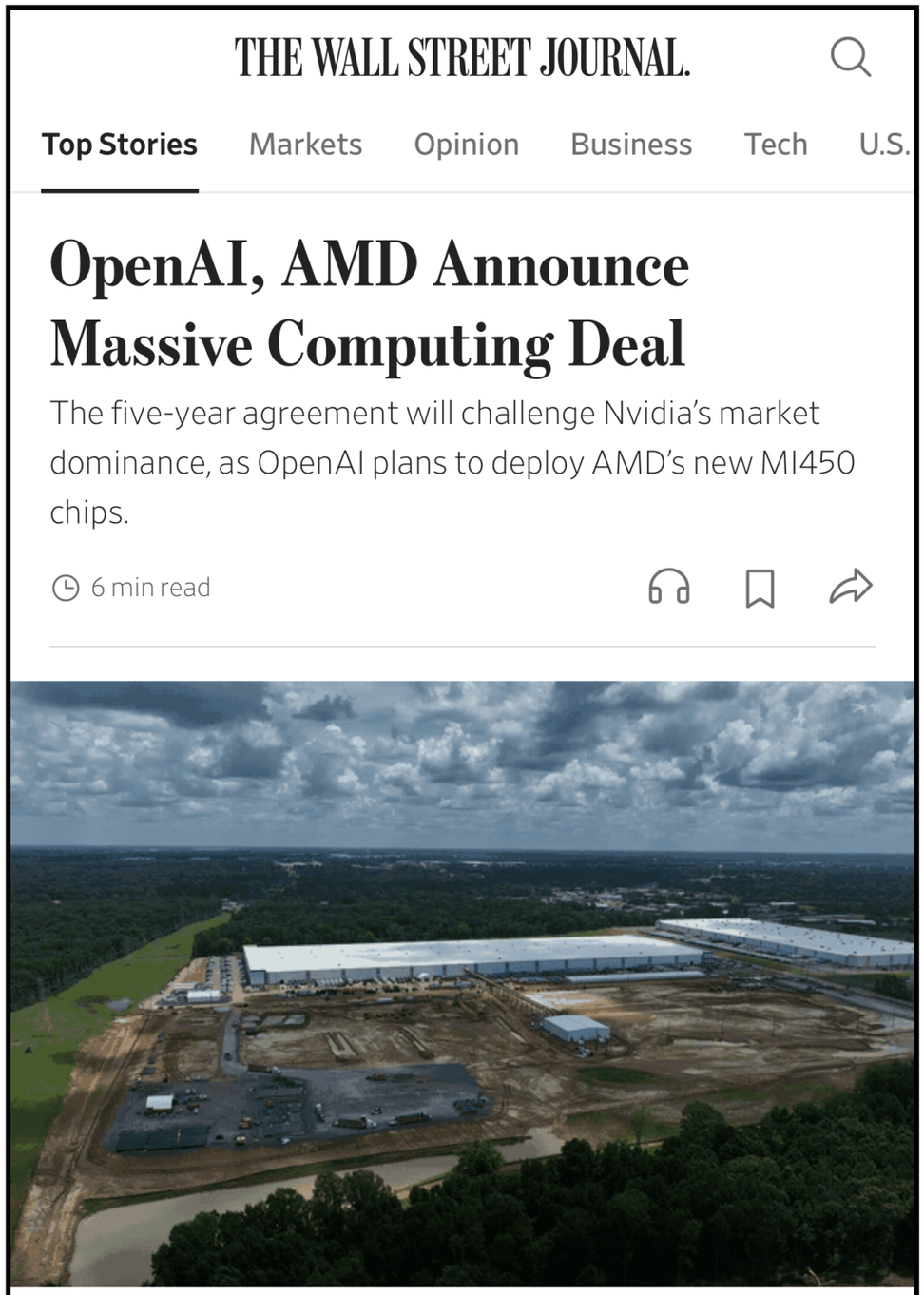

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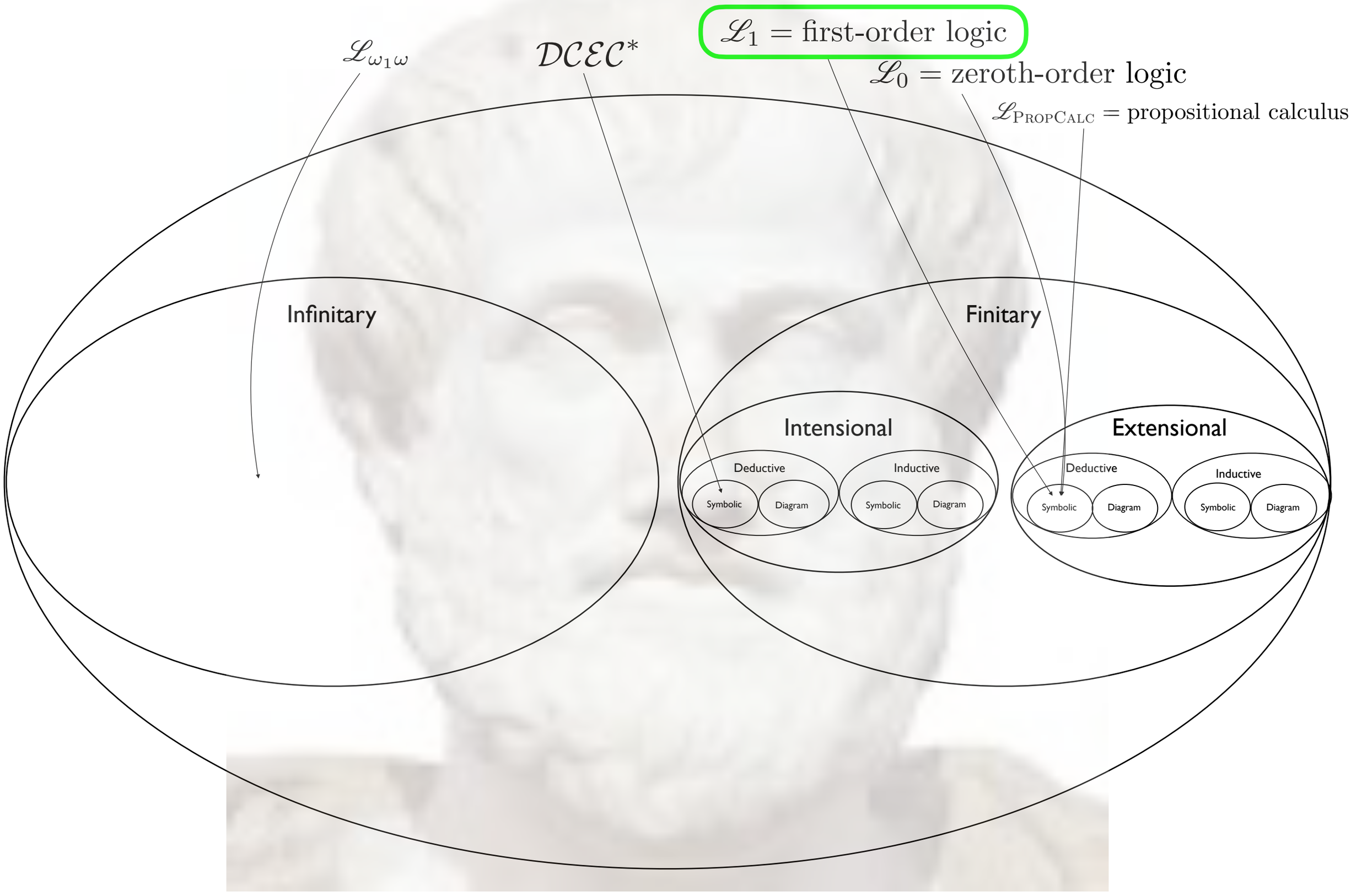
The Universe of Logics



The AI-&-Aristotle Adventure Continues …

Baroco

Festino

The Deductive Flexibility Test

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From the Reasoning Research Group, Adam Mickiewicz University, Poznan, Poland
http://murbansk-rrg.home.amu.edu.pl/research-projects/deductive-flexibility-test

The Deductive Flexibility Test

. . .

(A Final-Project Possibility!)

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Example with correct answer:

(1) Some nedges are dwens.
(2) Some strimes are dwens.
(3) Every nedge is a strime.
(4) Every nedge is a dwen.
(5) This is not the case, that no dwen is a strime.

Some dwens are strimes.

Answer: (2); (5); (3 and 4); (1 and 4)

Correct? To HyperSlate® …

From the Reasoning Research Group, Adam Mickiewicz University, Poznan, Poland
http://murbansk-rrg.home.amu.edu.pl/research-projects/deductive-flexibility-test

I (1) Every faub is a non-veece.
(2) No phodd is a veece.
(3) No veece is a phodd.
(4) Every veece is a non-faub.
(5) Every faub is a phodd.

No faub is a veece.

Answer:_____

The *Not*-So-Easy Inference Rule in FOL

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- `universal introduction`

The *Not*-So-Easy Inference Rule in FOL

- `universal introduction`
  - If something *a* is an *R*, and the constant/name *a* is *genuinely arbitrary*, then we can deduce that everything is an *R*.

The Inference Schema

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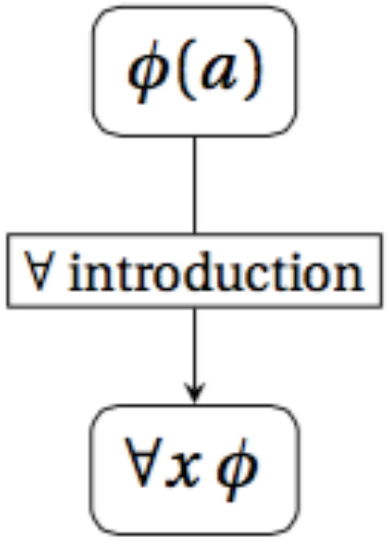
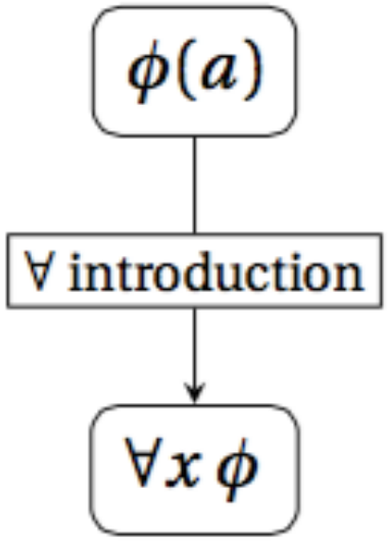


provided that a does not appear free in any in-scope assumption of ϕ, and that no occurrence of a appear in the inferred $\forall x\,\phi$ (3.16)

The Inference Schema



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(Why the provisos?)

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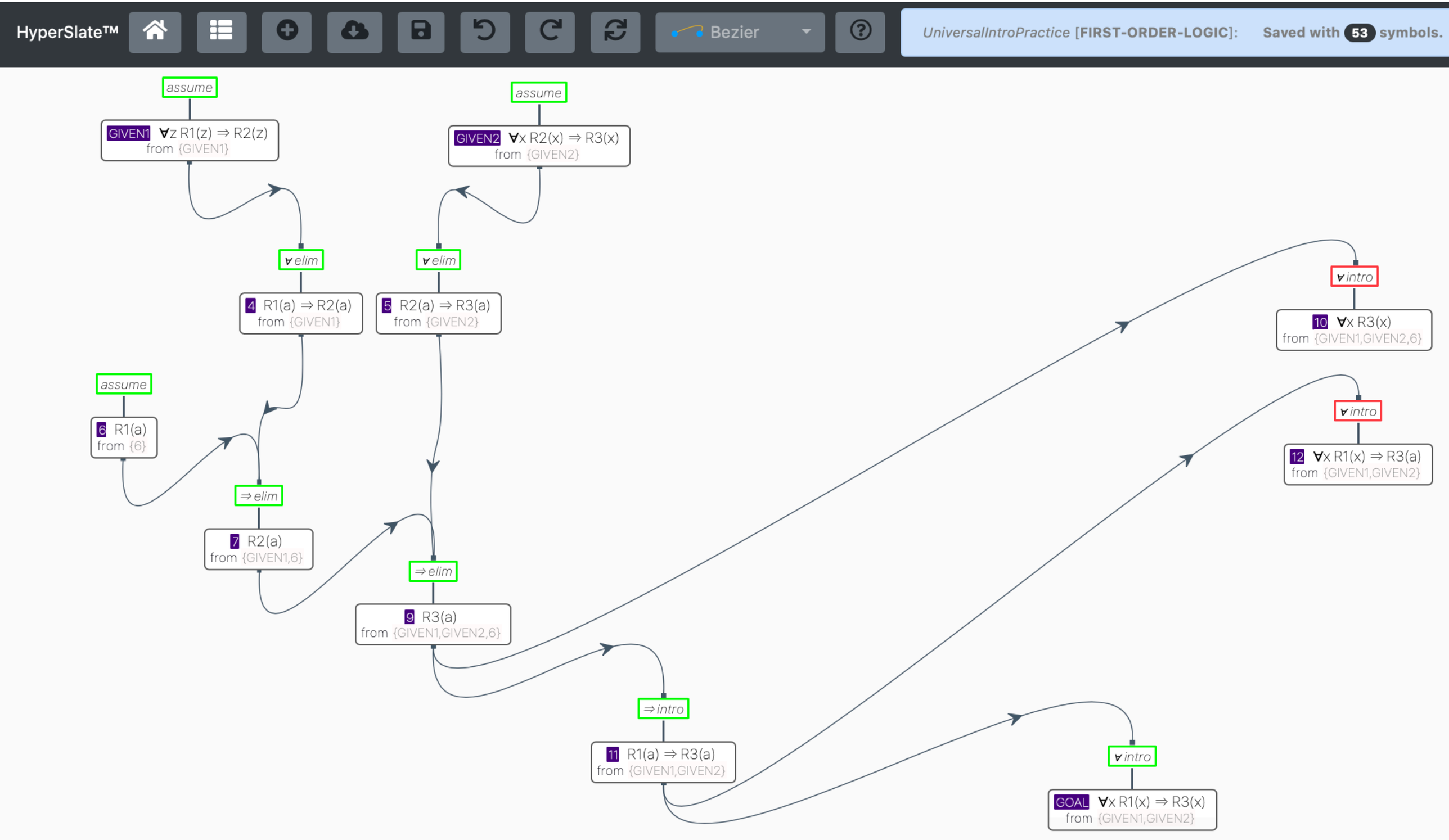

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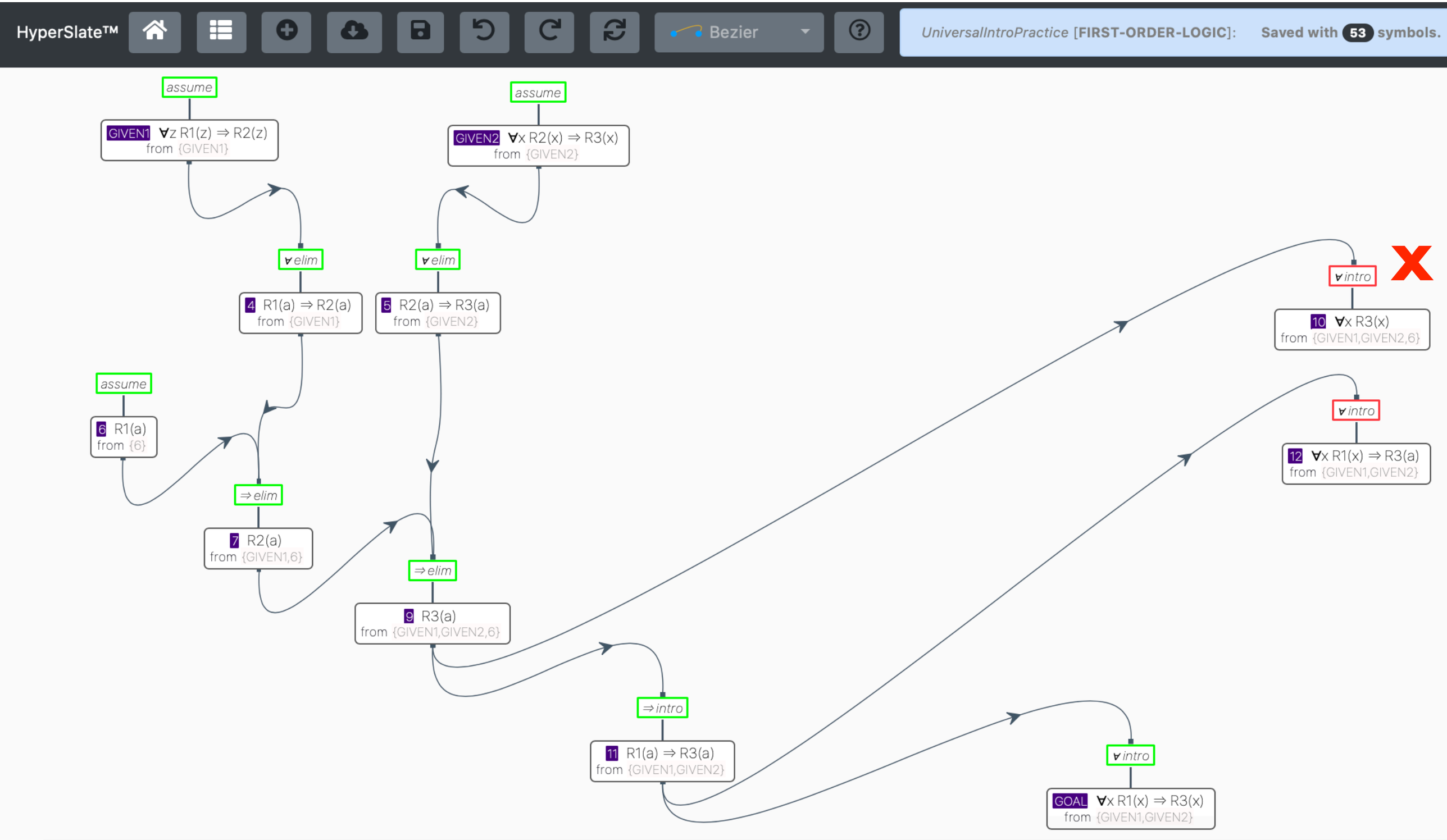

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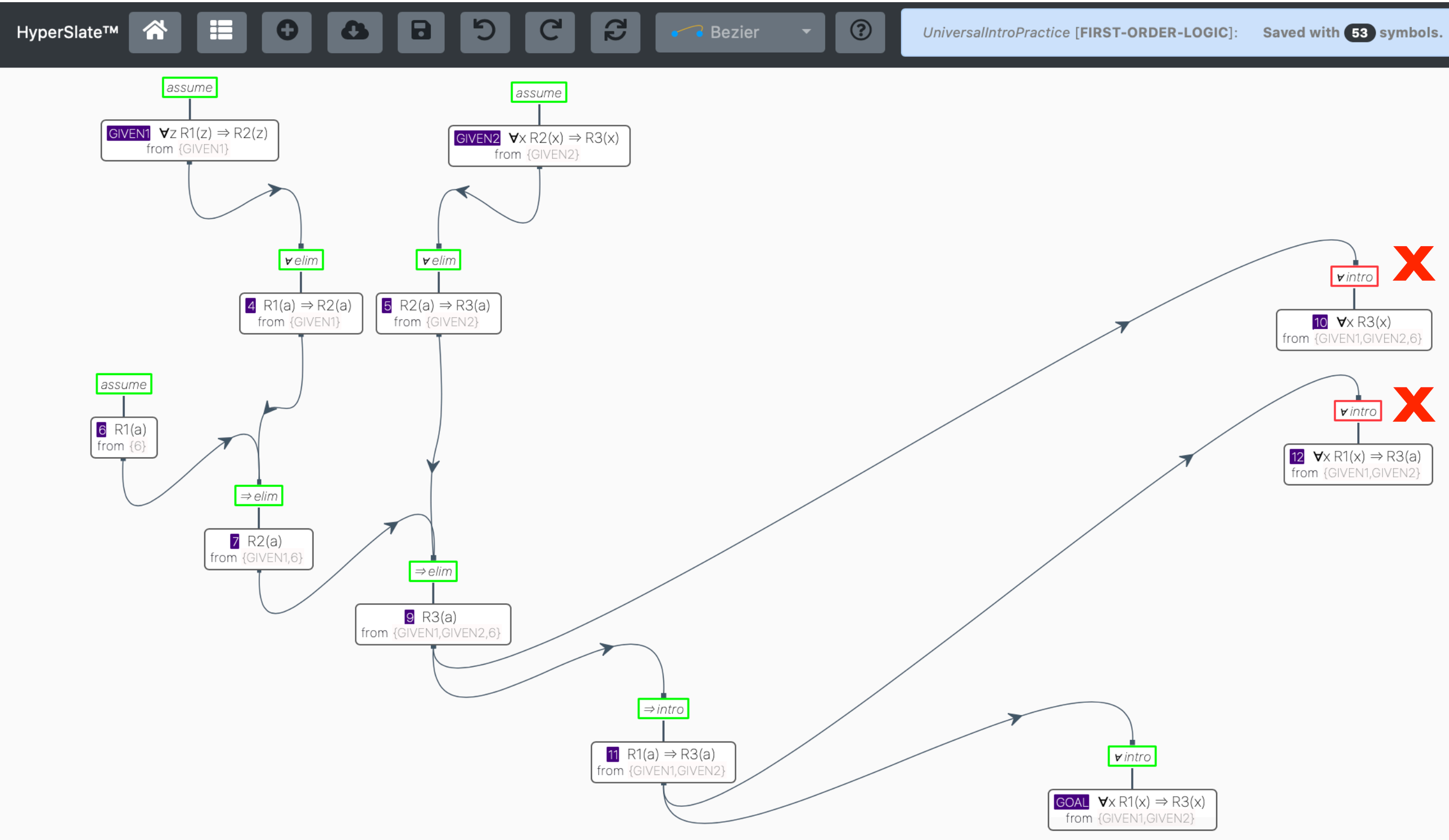

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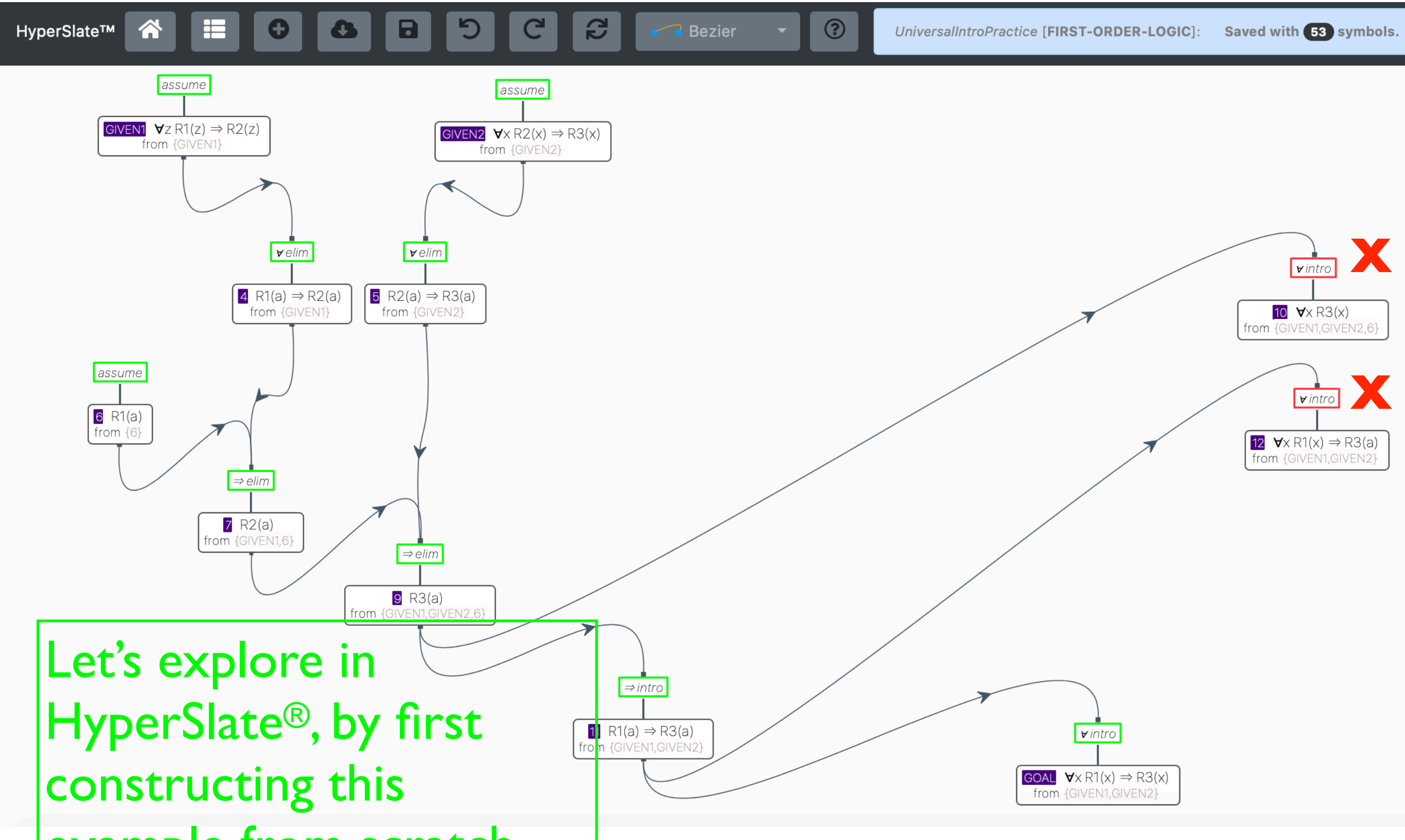

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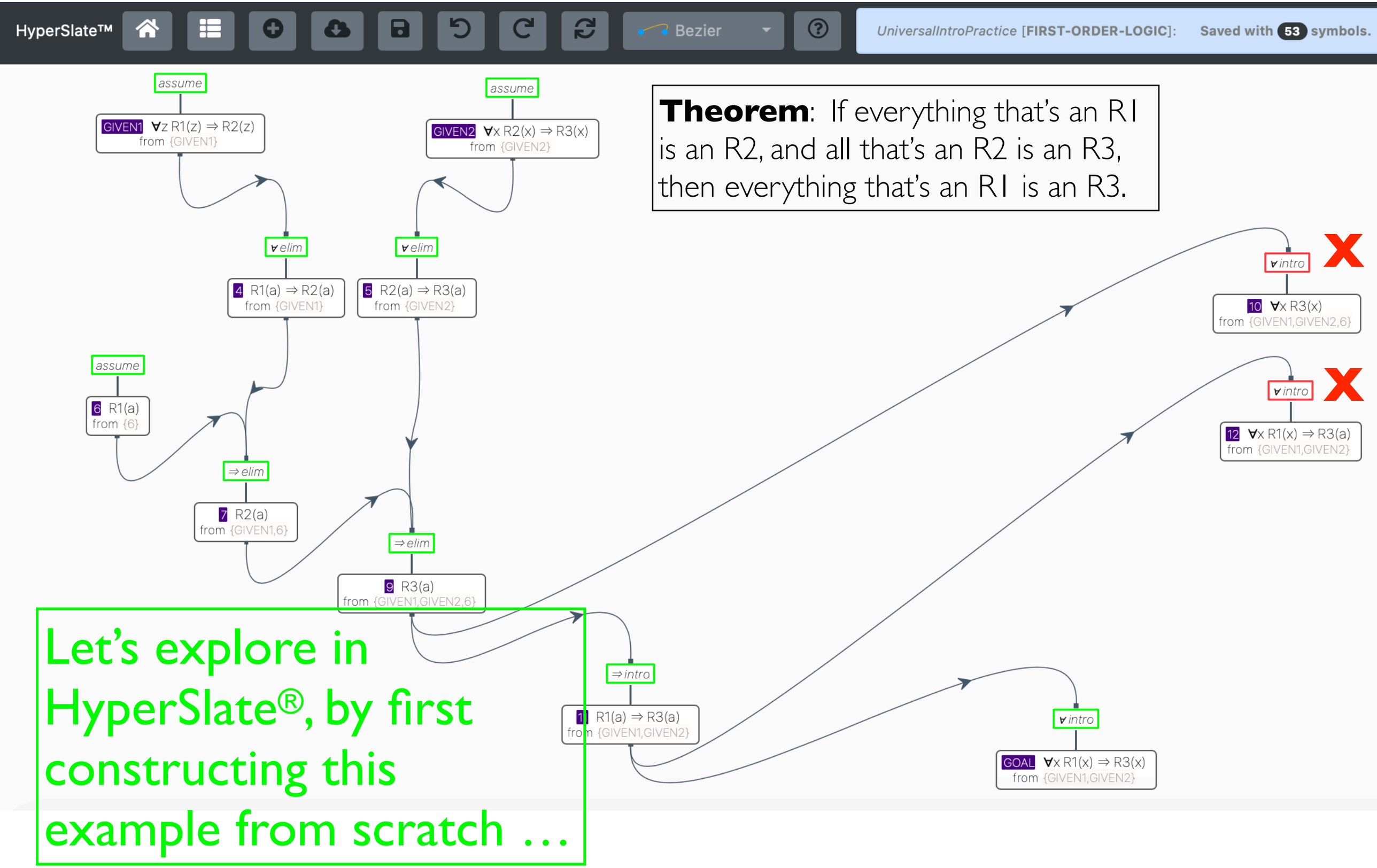

Theorem: If everything that's an R1 is an R2, and all that's an R2 is an R3, then everything that's an R1 is an R3.

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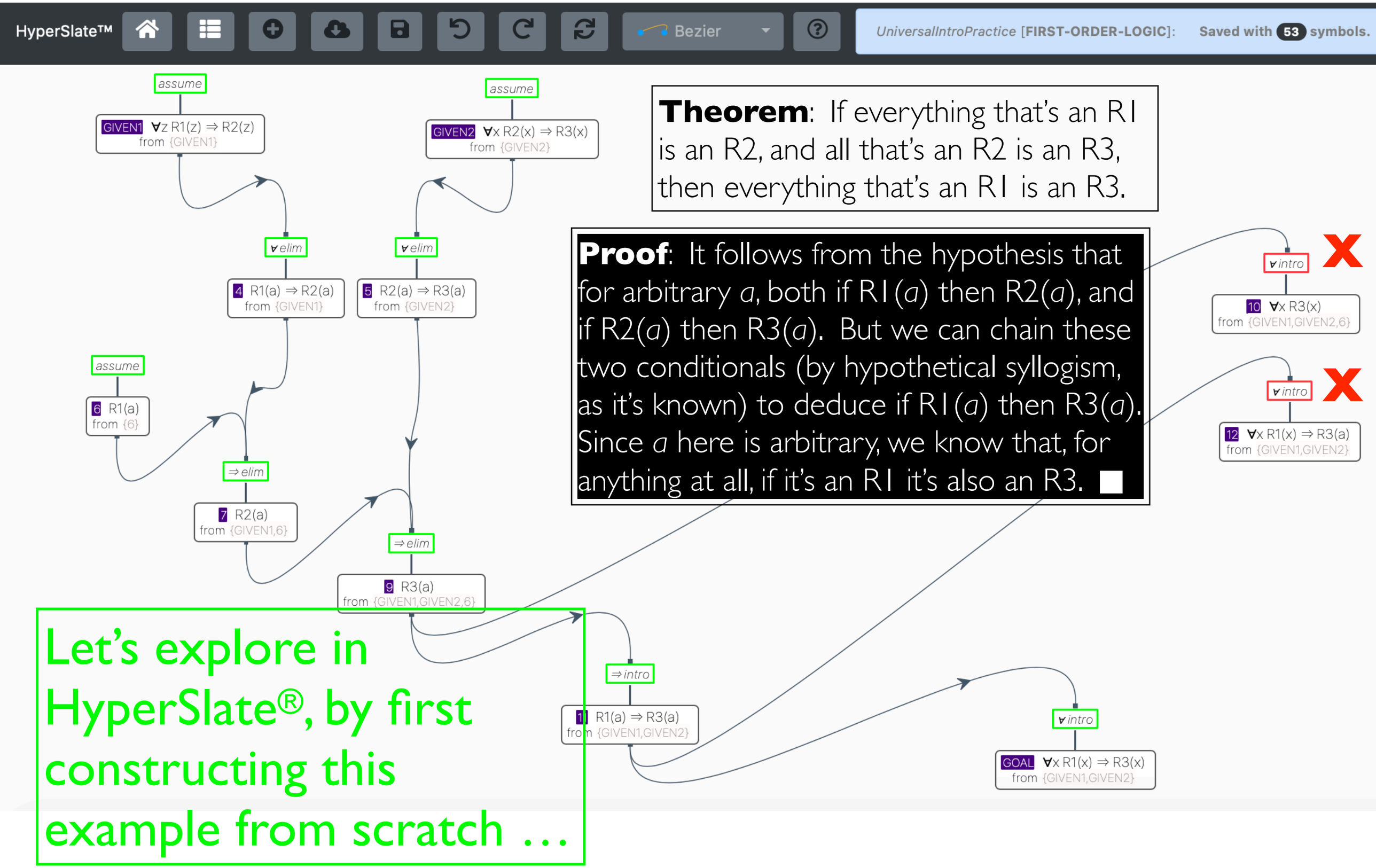

Theorem: If everything that's an R1 is an R2, and all that's an R2 is an R3, then everything that's an R1 is an R3.

Proof: It follows from the hypothesis that for arbitrary *a*, both if R1(*a*) then R2(*a*), and if R2(*a*) then R3(*a*). But we can chain these two conditionals (by hypothetical syllogism, as it's known) to deduce if R1(*a*) then R3(*a*). Since *a* here is arbitrary, we know that, for anything at all, if it's an R1 it's also an R3. ■

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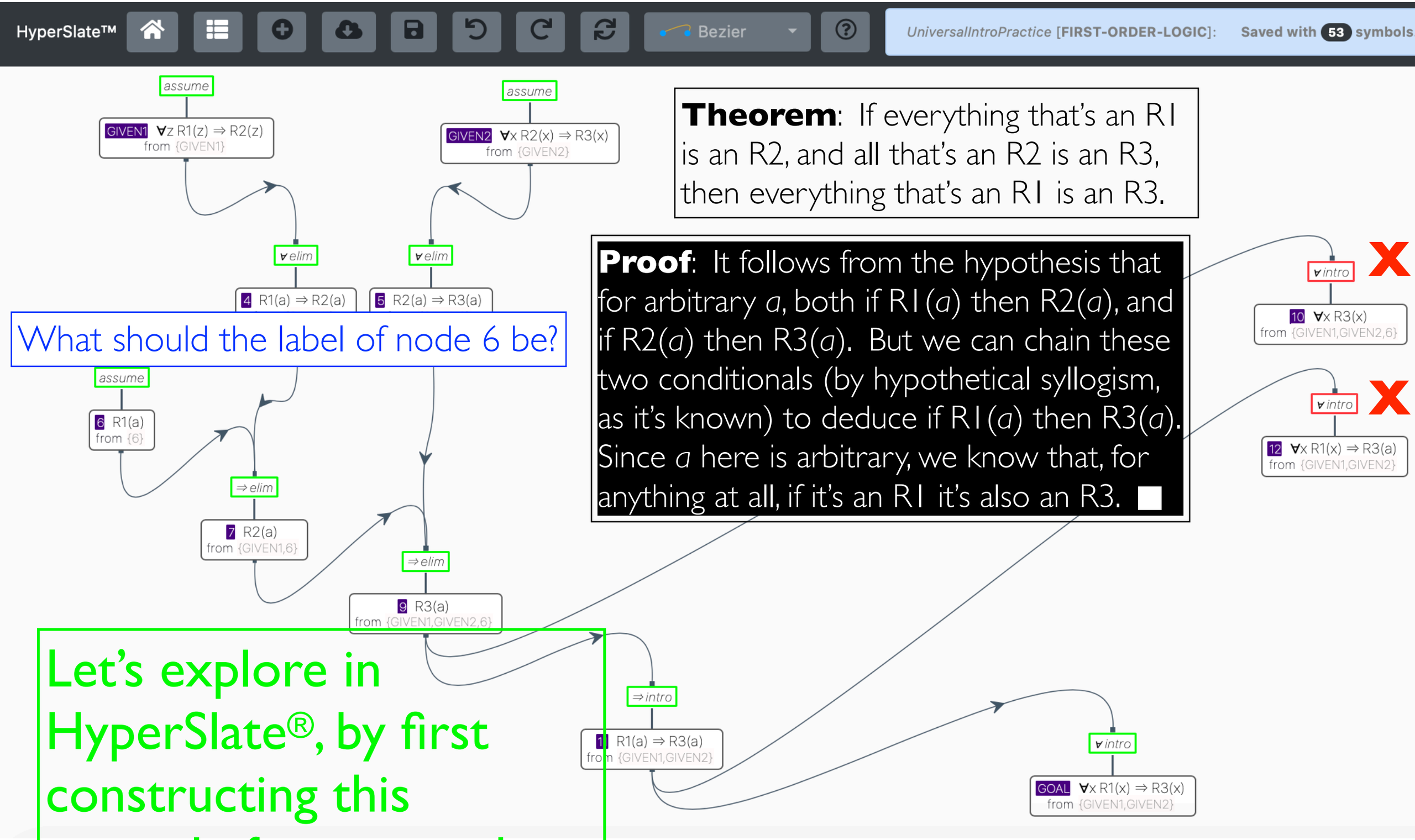

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Hvis du forstår det, kan du bevise det.