

LIMITATIONS OF LOGIC

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*when there are disputes among persons, we can simply say: **Let us calculate**, without further ado, and see who is right (Leibniz, *The Art of Discovery* (1685); C 176/W 51)*

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- ▶ I want to tell you (part of) the story of how I came to **love** logic.
- ▶ Way back when I started my undergraduate career (2007!) I was very much interested in **political philosophy** and **metaphysics** (I still am!).
- ▶ But I believed that all we had to do was discover the right **formal system** for these topics.
- ▶ Here's why I was **doomed to fail**, and why reality is far more **beautiful** and **interesting** than I'd anticipated.

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- ▶ Thus far in the course, you've looked at **semantics** (how we say that a sentence is **true**, e.g. truth tables) and **deduction** (how to build sequences following **rules of inference** e.g. disjunction introduction).

QUESTION

When do **deduction** and **semantic validity** (i.e. truth on every interpretation) coincide? i.e. Is **everything** that we can show to be semantically valid provable (and vice versa)?

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Answer: A lot of the time they **do** coincide.

THEOREM

Both propositional and first-order predicate logic are **sound** (everything provable is semantically valid) and **complete** (everything semantically valid is provable).

QUESTION

Can we just get our **perfect theory**, **calculate**, and answer **any question**?

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THEOREM

(Gödel's Incompleteness Theorems, **very** roughly put) Any theory that contains a **tiny** bit of mathematics, has sentences that:

1. Are true (at least we **think** they're true).
2. Aren't provable.

We'll **never** have a **single** perfect formal theory that can capture **everything** about the world.

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*I never am really satisfied that I understand **anything**; because, understand it well as I may, my comprehension can only be an **infinitesimal fraction** of all I want to understand — Ada Lovelace*

- ▶ There will always be discussion about what the **right** principles are, and there will **always** be a place for philosophers.
- ▶ One piece of the puzzle in **coming to learn this** was the study logic.
- ▶ What other **philosophical insights** does logic have for us?

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Thanks for listening!