

Leibniz on rational insight

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1 Rules of Inference vs. Axioms

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Rules of inference vs. Axioms

In formal derivations:

- Axioms are **formula** that are in no need of justification.
- Rules of inference appear in **justifications** that dictate the order in which formula occur.

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Axiomatic set-theoretic proof

1. $(\forall x)(\forall y)(x = y \leftrightarrow (\forall z)(z \in x \leftrightarrow z \in y))$ Axiom of extensionality
2. $(\forall y)(a \cap b = y \leftrightarrow (\forall z)(z \in a \cap b \leftrightarrow z \in y))$ $\forall E$ 1
3. $a \cap b = b \cap a \leftrightarrow (\forall z)(z \in a \cap b \leftrightarrow z \in y)$ $\forall E$ 2
4. $z \in a \cap b$ Assumption
5. $z \in a \ \& \ z \in b$ Defn \cap E 4
6. $z \in a$ $\&EL$ 5
7. $z \in b$ $\&ER$ 5
8. $z \in b \ \& \ z \in a$ $\&I$ 6,7
9. $z \in b \cap a$ Defn \cap I 8
10. $z \in b \cap a$ Assumption
11. \dots \dots
12. $z \in a \cap b$ Defn \cap I
13. $z \in a \cap b \leftrightarrow z \in b \cap a$ $\leftrightarrow I$ 9, 12
14. \dots \dots

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Rules of inference vs. Axioms

In formal derivations:

- Axioms are **formula** that are in no need of justification.
- Rules of inference are **justifications** that dictate the order in which formula occur.

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Two Views of Axioms and Rules

There are two common views about axioms (and rules of inference):

- **Conventionalism:** All axioms and rules of inference are arbitrary. Mathematicians could have chosen different axioms and different rules of inference.
- **Realism (about truth-value):**
 - Some mathematical axioms are **true**.
 - Rules of inference are **truth-preserving**.
 - E.g., We use $\varphi \& \psi \vdash \varphi$ rather than $\varphi \vdash \varphi \& \psi$ as a rule of inference because the former is truth-preserving, and the latter is not.

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Question: Which view does Leibniz hold, and why do you think so? Find appropriate textual support in Leibniz's letter to Queen Sophie Charlotte.

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Leibniz on necessary truths

Question: Which view does Leibniz hold, and why do you think so? Find appropriate textual support with your neighbor.

Answer: Leibniz is a realist; he thinks mathematical theorems are true.

- In fact, he thinks mathematical theorems are **necessary truths**.

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Leibniz on necessary truths

Question:

- ① What are necessary truths?
- ② Find examples of necessary truths in Leibniz's letter to Queen Sophie Charlotte. Find examples of truths that are contingent (i.e., *not* necessary) according to Leibniz.
- ③ Devise your own examples of assertions that Leibniz would consider to be necessary; do the same for contingent truths.

Leibniz on the “natural light”

- In his letter to Queen Charlotte, Leibniz argues that “we know [necessary truths] only by this natural light.”
- To do so, he first argues that our senses are incapable of providing us knowledge of necessary truths.

Group Work:

- Reconstruct Leibniz's argument that our senses are incapable of providing us knowledge of necessary truths [Leibniz, 1989, pp. 189-190].
- Reconstruct Leibniz's argument that “we know [necessary truths] only by this natural light.”
- Devise your own arguments for what you consider to be the most controversial Leibnizian premise.

Leibniz on the natural light

Analyze the last two paragraphs on page 189 of Leibniz's letter to Queen Charlotte. Each paragraph contains an argument.

Group work:

- What is the conclusion of each paragraph?
- Construct your own argument, using premises you think Leibniz would accept, for each conclusion.

Up Next

Where We're Going



- Leibniz's logic
- Leibnizian analysis

References I

Leibniz, G. W. (1989). G.W. Leibniz: Philosophical Essays. *Indianapolis and Cambridge: Hackett Publishing Company.*