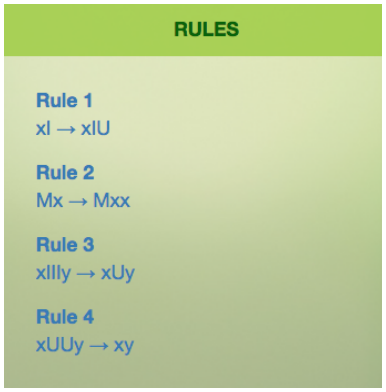
This is an interface for producing derivations is Hofstadter's formal system called MIU.[1] The box at the top centre contains the theorem to be derived—it's the string you want to produce.

This is achieved by applying the inference rules on the right to the string in the transformation box.



The transformation box always begins with the string `MI`, since that is the one Axiom of the system, but it will update after a rule is applied.

The box on the left keeps track of the derivation, i.e. it is a record of the transformations made.

By default (at least for now until we tack on the problem generator) the page asks you to derive `MUI`*. Note, however, that this "goal" box is editable. You can, in fact, enter any string into the box. But be careful, not every string you can enter is a theorem (nor even a well-formed string).*

(1) Derive of the following theorems: `MIU, MUI, MIIII, MIIU, MIUI, MIIUIIU, MUUII, MUUIIUIIU`

(2) Is `MUUIU` a theorem? If so, is there a shorter derivation of it than the shortest derivation of `MUIIU`?

(3) Is `MU` a theorem? If so, derive it; if not explain why.

[1] The formal system MIU is developed and discussed in Hofstadter, Douglas R. (1979) *Gödel, Escher, Bach: An Eternal Golden Braid*, Chapter 1: The MU-Puzzle, pp. 33-41, Basic Books.

- Language of MIU:
  - **Basic symbols**: `M`, `I`, `U`
  - **Formation rule**: Any finite string (of basic symbols of MIU) is well-formed.

- Deductive apparatus of MIU:
  - **Axiom**:

$$\texttt{MI}$$

  - **Rule 1**:

$$\frac{x\texttt{I}}{x\texttt{IU}}$$

  - **Rule 2**:

$$\frac{\texttt{M}x}{\texttt{M}xx}$$

  - **Rule 3**:

$$\frac{x\texttt{III}y}{x\texttt{U}y}$$

  - **Rule 4**:

$$\frac{x\texttt{UU}y}{xy}$$

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