

# Polylogarithms at non-positive (i.e. negative) multi-indices

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## Abstract

We extend the definition and construct several bases for polylogarithms  $\text{Li}_T$ , where  $T$  are recognizable, by a finite state (multiplicity) automaton and of alphabet  $X = \{x_0, x_1\}$ <sup>1</sup>. The kernel of the ‘‘polylogarithmic map’’  $\text{Li}_\bullet$  is also characterized and provides a rewriting process which terminates to a normal form. We mostly concentrate on the algebraic aspects of this extension.

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- [1] G erard H. E. Duchamp, Hoang Ngoc Minh, Ngo Quoc Hoan, *The algebra of Kleene stars of the plane and polylogarithms*, hal-01267134.

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<sup>1</sup>The space of rational series considered here is  $(\mathbb{C}\langle X \rangle \sqcup \mathbb{C}^{\text{rat}}\langle\langle x_0 \rangle\rangle \sqcup \mathbb{C}^{\text{rat}}\langle\langle x_1 \rangle\rangle, \sqcup, 1_{X^*})$ .