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Polylogarithms for all genera: numerics and identities

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Polylogarithms on higher-genus Riemann surfaces are necessary for systematic calculations of certain Feynman integrals and loop amplitudes in string theory. Employing the Schottky uniformization of a Riemann surface we construct higher-genus generating functions of polylogarithmic integration kernels, coinciding with the set of meromorphic differentials defined by Enriquez. This allows for numerical evaluation of hyperelliptic polylogarithms, which we can relate to sums of iterated integrals over elliptic integration kernels.

In a second part, we investigate functional relations between higher-genus polylogarithms, which rely on identities for the integration kernels. We derive identities for generating series of Enriquez' meromorphic integration kernels, generalizing the genus-one Fay identities, and show that our set of three-point identities is exhaustive.

(Based on arXiv:2406.10051 and arXiv:2409.08208)

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