Symbolic evaluation of log-sine integrals in polylogarithmic terms.

Generalized log-sine integrals, first studied systematically by Lewin 50 years ago, appear in many settings in number theory and analysis: for instance, they can be used to express classes of inverse binomial sums. As such they have reappeared in recent work on the epsilon-expansion of Feynman diagrams in physics; they have also proved useful in the study of certain multiple Mahler measures. We sketch these developments and present results which allow for the symbolic computation of log-sine integrals in terms of Nielsen polylogarithms at related argument. In particular, log-sine integrals at $\pi/3$ are shown to evaluate in terms of polylogarithms at the sixth root of unity. (Received September 04, 2011)