

Two Complete Reduction Systems for Integration

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We apply Norman’s completion process [1] to the Risch-Norman integration method [2] instead of using heuristic degree bounds to find antiderivatives in the differential polynomial ring generated by the given special functions. However, the behaviour of the completion process depends not only on the ring, but also on the ordering selected for terms. It may happen that the completion process does not terminate and yields an infinite number of reduction rules, which makes it hard to determine a complete reduction system. In such a case, one has to find finitely many formulae to denote the infinite number of reduction rules. By fixing adapted orderings, we present complete reduction systems for two families of functions satisfying second-order differential equations. In addition, they allow us to find rigorous weighted degree bounds for the antiderivatives.

Keywords

Completion process, Risch-Norman algorithm, Symbolic integration.

References

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[2] ARTHUR C. NORMAN; P. M. A. MOORE, Implementing the New Risch Algorithm. *Proc. 4th International Colloquium on Advanced Computing Methods in Theoretical Physics*, pp. 99–110, 1977.