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Koepf, Wolfram (D-KOZU)

The algebra of holonomic equations. (English summary)

Math. Semesterber. **44** (1997), *no. 2,* 173–194.

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References: 0	**Reference Citations: 0**	**Review Citations: 0**

A differential equation is called holonomic if it is linear with polynomial coefficients; a function (or formal power series) is holonomic if it satisfies such an equation, and a sequence is holonomic if it is the coefficient sequence of such a power series (equivalently, satisfies a linear recurrence with polynomial coefficients). The lowest-order holonomic equation or recurrence satisfied by a function or sequence, together with initial conditions, provides a canonical descriptor for it. Descriptors for sums and products of holonomic functions can be computed from descriptors of the terms involved, so identities involving holonomic functions can be proved or disproved by checking the descriptors of both sides. Over the last decade, algorithms based on these ideas have been implemented in various computer algebra systems such as Maple, Mathematica, and Reduce.

This survey paper presents the computer solutions of a number of examples illustrating various ways in which these algorithms can be applied, along with explanations and commentary, some history, and an extensive bibliography that make it a good introduction to the subject.

Reviewed by *Hale F. Trotter*