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Koepf, Wolfram

Closed form Laurent-Puiseux series of algebraic functions. (English)

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Let y be an algebraic function defined by a polynomial equation $P(x, y) = 0$ whose coefficients are polynomials in x over a field K which may be one of the fields , or . *D. V.* and *G. V. Chudnovsky* [J. Complexity 2, 271-294 (1986; Zbl 629.68038); ibid. 3, 1-25 (1987; Zbl 656.34003)] describe a pair of algorithms to calculate the coefficients in the Laurent-Puiseux developments of the branches of y: The first algorithm returns a linear differential equation

$$q_n(x)y^{(n)} + y_{n-1}(x)y^{(n-1)} + \cdots + q_1(x)y' + q_0(x)y = 0$$

which is satisfied by all branches of y and whose coefficients are polynomials in x over K, the other uses this differential equation to get a linear recurrence relation for the Puiseux coefficients. The author used this algorithms (the second in a simpler version) to calculate the recurrence relation; if this relation contains only two terms, an algorithm found by the author returns an explicit formula for the Puiseux coefficients [J. Symb. Comp. 13, 581-603 (1992; Zbl 758.30026)]. In this paper, the author gives examples to illustrate his algorithms and to show that for many algebraic functions defined by polynomials of low degree a closed form of their Puiseux coefficients may be calculated. He points out that on the other side the complexity of the resulting recurrence equation may be extremely high even for an algebraic function defined by a sparse polynomial of low degree.

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Keywords : Laurent-Puiseux series; algebraic functions

Citations : Zbl 629.68038; Zbl 656.34003; Zbl 758.30026

Classification:

- 30B10 Power series (one complex variable)
- 12Y05 Computational aspects of field theory and polynomials
- 68Q40 Symbolic computation, algebraic computation
- 68W30 Symbolic computation and algebraic computation