

Determining Whether a Multivariate Hyperexponential Function is Algebraic

Ziming Li, Dabin Zheng

Key Laboratory of Mathematics Mechanization, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing 100080, China

收稿日期 修回日期 网络版发布日期 2006-11-3 接受日期

摘要 Let $F = \mathbb{C}(x_1, x_2, \dots, x_\ell, x_{\ell+1}, \dots, x_m)$, where x_1, x_2, \dots, x_ℓ are differential variables, and $x_{\ell+1}, \dots, x_m$ are shift variables. We show that a hyperexponential function, which is algebraic over F , is of form

$$\prod_{i=1}^t g(x_1, x_2, \dots, x_m) q(x_1, x_2, \dots, x_\ell)^{\frac{1}{t}} \omega_{\ell+1}^{x_{\ell+1}} \cdots \omega_m^{x_m},$$

where $g \in F$, $q \in \mathbb{C}(x_1, x_2, \dots, x_\ell)$, $t \in \mathbb{Z}^+$ and $\omega_{\ell+1}, \dots, \omega_m$ are roots of unity. Furthermore, we present an algorithm for determining whether a hyperexponential function is algebraic over F .

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Key words [Algebraic functions](#) [hyperexponential functions](#) [rational certificates](#) [rational normal forms](#)

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