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在共振点附近的一类二阶泛函微分方程的解析解

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摘要 在复域 \mathbb{C} 内研究一类包含未知函数迭代的二阶微分方程 $x''(z)=G(z, x(z), x^2(z), \dots, x^m(z))$ 的解析解的存在性. 通过Schröder变换, 即 $x(z)=y(\alpha y^{-1}(z))$, 把这类方程转化为一种不含未知函数迭代的泛函微分方程 $\alpha^2 y''(\alpha z)y'(z)-\alpha y'(\alpha z)y''(z)=(y'(z))^3 G(y(z), y(\alpha z), \dots, y(\alpha^m z))$, 并给出它的局部可逆解析解. 本文不仅讨论了双曲型情形 $0<|\alpha|<1$ 和共振的情形(α 是一个单位根), 而且还在Brjuno条件下讨论了共振点附近的情形(即单位根附近).

关键词 [迭代泛函微分方程](#) [解析解](#) [共振](#)

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Analytic Solutions for a Second-Order Iterative Functional Differential Equation near Resonance

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Abstract In this paper, the second-order differential equation involving iterates of the unknown function $x''(z)=G(z, x(z), x^2(z), \dots, x^m(z))$ is investigated in the complex field \mathbb{C} for the existence of analytic solutions. By reducing the equation with the Schröder transformation, $x(z)=y(\alpha y^{-1}(z))$, to another functional differential equation without iteration of the unknown function $\alpha^2 y''(\alpha z)y'(z)-\alpha y'(\alpha z)y''(z)=(y'(z))^3 G(y(z), y(\alpha z), \dots, y(\alpha^m z))$, we give the existence of its local invertible analytic solutions. We discuss not only those α given in Schröder transformation in the hyperbolic case $0<|\alpha|<1$ and resonance, i.e., at a root of the unity, but also those α near resonance (i.e., near a root of the unity) under Brjuno condition.

Key words [iteration functional differential equation](#) [analytic solution](#) [resonance](#)

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