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Results of certain types of nonlinear delay differential equation. (Chinese. English summary)

Summary: We show that if the following delay differential equation
\[ [w(z + 1)w(z) - 1][w(z)w(z - 1) - 1] + a(z) \frac{w'(z)}{w(z)} = \sum_{i=0}^{p} a_i(z)w^i \]
with rational coefficients \(a(z), a_i(z), b_j(z)\), admits a transcendental meromorphic solution \(w\) of finite many poles with hyper-order less than one, then it reduces into a more simple delay differential equation, which improves some known theorems obtained most recently by K. Liu and C. J. Song [Anal. Math. 45, No. 3, 569–582 (2019; Zbl 1449.30070)]. Moreover, we also study the delay differential equations of Tumura-Clunie type and obtain some quantitative properties of transcendental meromorphic solutions.

MSC:
34K41 Functional-differential equations in the complex domain
34M05 Entire and meromorphic solutions to ordinary differential equations in the complex domain
34M10 Oscillation, growth of solutions to ordinary differential equations in the complex domain
30D35 Value distribution of meromorphic functions of one complex variable, Nevanlinna theory

Keywords:
entire solution; nonlinear delay differential equation; Tumura-Clunie theory; growth order

Full Text: Link

References:
[15] Huang Z. B., Chen Z. X., Li Q., On properties of meromorphic solutions for complex difference equation of Malmquist type,