
Janne Heittokangas, Risto Korhonen, Ilpo Laine, Jarkko Rieppo, and Kazuya Tohge

Complex Difference Equations of Malmquist Type

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Abstract. In a recent paper [1], Ablowitz, Halburd and Herbst applied Nevanlinna theory to prove some results on complex difference equations reminiscent of the classical Malmquist theorem in complex differential equations. A typical example of their results tells us that if a complex difference equation $y(z + 1) + y(z - 1) = R(z, y)$ with $R(z, y)$ rational in both arguments admits a transcendental meromorphic solution of finite order, then $\deg_y R(z, y) \leq 2$. Improvements and extensions of such results are presented in this paper. In addition to order considerations, a result (see Theorem 13) is proved to indicate that solutions having Borel exceptional zeros and poles seem to appear in special situations only.

Keywords. Complex difference equation, value distribution, Nevanlinna characteristic, Borel exceptional values.

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