

Trichotomy of nonoscillatory solutions to second order neutral difference equation with quasi-difference

Magdalena Nockowska-Rosiak

Institute of Mathematics, Lodz University of Technology
Wólczańska 215, 90-924, Łódź, Poland
magdalena.nockowska@p.lodz.pl

Collaborative work with:

Agata Bezubik, Institute of Mathematics, University of Bialystok, Poland,
Małgorzata Migda, Institute of Mathematics, Poznan University of Technology,
Poland,
Ewa Schmeidel, Institute of Mathematics, University of Bialystok, Poland.

In this talk we provide a survey of the nonlinear second order neutral difference equation in the following form

$$\Delta (a_n \Delta (x_n - p_n x_{n-1})) + q_n f(x_{n-\tau}) = 0,$$

where (a_n) , (p_n) , (q_n) are sequences of positive real numbers, τ is a nonnegative integer, and function $f: \mathbb{R} \rightarrow \mathbb{R}$. By suitable substitution the above equation is transformed into a new one which is a third order non-neutral difference equation. Using results obtained for the new equation, asymptotic properties of the neutral difference equation are studied. Some classification of nonoscillatory solutions is presented, as well as an estimation of solutions. Finally, necessary and sufficient conditions for the existence of solutions to both considered equations asymptotically equivalent to the given sequences are presented. These results are contained in [1].

[1] Bezubik A., Migda M., Nockowska-Rosiak M., Schmeidel E., Trichotomy of nonoscillatory solutions to second order neutral difference equation with quasi-difference, *Adv. Difference Equ.*, (2015) 192.