

# Non-ordered periodic upper and lower solutions for difference equation with discret $\phi$ -Laplacian

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Let  $\phi : \mathbb{R} \rightarrow ]-a, a[$  ( $0 < a \leq \infty$ ) be an increasing homeomorphism with  $\phi(0) = 0$ . Let also  $n \geq 3$  be an integer and  $f_m : \mathbb{R} \rightarrow \mathbb{R}$  ( $2 \leq m \leq n-1$ ) be continuous functions. Assume that the periodic boundary value problem

$$D\phi(Dx_m) + f_m(x_m, Dx_m) = 0 \quad (2 \leq m \leq n-1), \quad x_1 = x_n, \quad Dx_1 = Dx_{n-1}$$

has a lower solution  $\alpha$  and an upper solution  $\beta$ . If  $f_m$  ( $2 \leq m \leq n-1$ ) are bounded from below (with bounds sufficiently small when  $\phi$  is bounded), then we prove that we have existence.

This result is a joint work with Jean Mawhin and is a discrete version of a result due to Irena Rachůnková and Milan Tvrdý.