

Properties of summation equations of Volterra type involving the p -Laplacian

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We establish sufficient conditions for the existence of solutions to a Volterra-type difference equation involving the p -Laplacian operator

$$\Delta(r(n)\varphi_p(\Delta(x(n+1) - b(n)x(n)))) = a(n) + \sum_{k=1}^n K(n, k)f(x(k)),$$

where $n \in \mathbb{N}$, $a, b: \mathbb{N} \rightarrow \mathbb{R}$, $r: \mathbb{N} \rightarrow \mathbb{R} \setminus \{0\}$, and $K: \mathbb{N} \times \mathbb{N} \rightarrow \mathbb{R}$, and $\varphi_p(t) = |t|^{p-2}t$ with $p \geq 2$. Specifically, we investigate solutions that are asymptotically equivalent to a given sequence, depending on the coefficients of the neutral term. The main results are obtained by employing Schauder's fixed-point theorem, covering both cases where $b(n) \neq 0$ and the non-neutral case where $b(n) \equiv 0$.

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