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Convexity of Generators of L^p -like Paranorms

Let (Ω, Σ, μ) be a measure space with at least two disjoint sets of finite and positive measure, and $S_+ = S_+(\Omega, \Sigma, \mu)$ denote the set of all μ -integrable simple functions $\mathbf{x} : \Omega \rightarrow \mathbb{R}_+$ having support $\Omega(\mathbf{x})$ of positive measure. Then, for an arbitrary bijection $\varphi : (0, \infty) \rightarrow (0, \infty)$, the functional $\mathbf{P}_\varphi : S_+ \rightarrow \mathbb{R}_+$ given by $\mathbf{P}_\varphi(\mathbf{x}) := \varphi^{-1}(\int_{\Omega(\mathbf{x})} \varphi \circ x d\mu)$ is well defined. The results presented support the conjecture that subadditivity of \mathbf{P}_φ implies the convexity of φ . The case of superadditivity of \mathbf{P}_φ is also discussed.

Keywords: Convex function, L-p-norm, Minkowski-type inequality, Mulholland inequality, Gauss-invariant mean.

MSC: 26A51, 26B25, 26D15, 39B62.