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A Universal Bound on the Variations of Bounded Convex Functions

Given a convex set C in a real vector space E and two points $x, y \in C$, we investivate which are the possible values for the variation $f(y) - f(x)$, where $f : C \longrightarrow [m, M]$ is a bounded convex function. We then rewrite the bounds in terms of the Funk weak metric, which will imply that a bounded convex function is Lipschitz-continuous with respect to the Thompson and Hilbert metrics. The bounds are also proved to be optimal. We also exhibit the maximal subdifferential of a bounded convex function at a given point $x \in C$.