

# Convex Functions on Discrete Time Domains

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*Abstract.* In this paper, we introduce the definition of a convex real valued function  $f$  defined on the set of integers,  $\mathbb{Z}$ . We prove that  $f$  is convex on  $\mathbb{Z}$  if and only if  $\Delta^2 f \geq 0$  on  $\mathbb{Z}$ . As a first application of this new concept, we state and prove discrete Hermite-Hadamard inequality using the basics of discrete calculus (i.e. the calculus on  $\mathbb{Z}$ ). Second, we state and prove the discrete fractional Hermite-Hadamard inequality using the basics of discrete fractional calculus. We close the paper by defining the convexity of a real valued function on any time scale.