

Some applications of the Hermit-Hadamard inequality for log-convex functions in quantum divergence

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Abstract

One of the beautiful and very simple inequalities for a convex function is the Hermit-Hadamard inequality [S. Mehmood, et. al. Math. Methods Appl. Sci., 44 (2021) 3746], [S. Dragomir, et. al., Math. Methods Appl. Sci., in press]. The concept of log-convexity is a stronger property of convexity. Recently, the refined Hermit-Hadamard's inequalities for log-convex functions were introduced by researchers [C. P. Niculescu, Nonlinear Anal. Theor., 75 (2012) 662]. In this paper, by the Hermit-Hadamard inequality, we introduce two parametric Tsallis quantum relative entropy, two parametric Tsallis-Lin quantum relative entropy and two parametric quantum Jensen-Shannon divergence in quantum information theory. Then some properties of quantum Tsallis-Jensen-Shannon divergence for two density matrices are investigated by this inequality. \newline \textbf{Keywords:} \textit{Hermit-Hadamard's inequality; log-convexity; Density matrices; Quantum relative entropy; Tsallis quantum relative entropy; quantum Jensen-Shannon divergence divergence}.

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