



RÉNYI'S QUANTUM THERMODYNAMICAL INEQUALITIES*

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Abstract. A theory of thermodynamics has been recently formulated and derived on the basis of Rényi entropy and its relative versions. In this framework, the concepts of partition function, internal energy and free energy are defined, and fundamental quantum thermodynamical inequalities are deduced. In the context of Rényi's thermodynamics, the variational Helmholtz principle is stated and the condition of equilibrium is analyzed. The results reduce to the von Neumann ones when the Rényi entropic parameter α approaches 1. The main goal of the article is to give simple and self-contained proofs of important known results in quantum thermodynamics and information theory, using only standard matrix analysis and majorization theory.

Key words. Rényi entropy, Rényi relative entropy, Partition function, Helmholtz free energy, α -variance.

AMS subject classifications. 47A12, 62F30, 54C10.

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