

Generalization of Tsallis Entropy from a Q-Deformed Arithmetic

Authors : J. Juan Peña, J. Morales, J. García-Ravelo, J. García-Martínes

Abstract : It is known that by introducing alternative forms of exponential and logarithmic functions, the Tsallis entropy S_q is itself a generalization of Shannon entropy S . In this work, from a deformation through a scaling function applied to the differential operator, it is possible to generate a q -deformed calculus as well as a q -deformed arithmetic, which not only allows generalizing the exponential and logarithmic functions but also any other standard function. The updated q -deformed differential operator leads to an updated integral operator under which the functions are integrated together with a weight function. For each differentiable function, it is possible to identify its q -deformed partner, which is useful to generalize other algebraic relations proper of the original functions. As an application of this proposal, in this work, a generalization of exponential and logarithmic functions is studied in such a way that their relationship with the thermodynamic functions, particularly the entropy, allows us to have a q -deformed expression of these. As a result, from a particular scaling function applied to the differential operator, a q -deformed arithmetic is obtained, leading to the generalization of the Tsallis entropy.

Keywords : q -calculus, q -deformed arithmetic, entropy, exponential functions, thermodynamic functions

Conference Title : ICMSSC 2024 : International Conference on Mathematics, Statistics and Scientific Computing

Conference Location : Santorini, Greece

Conference Dates : July 11-12, 2024