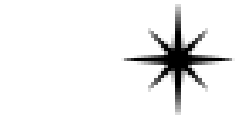

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Identity for scalar-valued functions of tensors and its applications in classical field theories and gravity

Wednesday 7 September 2022 11:00 (20 minutes)

We present a theorem on scalar-valued functions of tensors, where ”scalar”refers to absolute scalars as well as relative scalars of weight w. The theorem thereby generalizes an identity referred to earlier by Rosenfeld in his publication ”On the energy-momentum tensor”and provides a (1,1)-tensor identity which can be regarded as the tensor analogue of the identity following from Euler’s theorem on homogeneous functions. The remarkably simple identity is independent of any internal symmetries of the constituent tensors, providing a powerful tool for deriving relations between field-theoretical expressions and physical quantities. We apply the identity especially for analyzing the relation of metric and canonical energy-momentum tensors of matter and gravity. The identity allows to formulate an equivalent representation of a generalized Einstein field equation for arbitrary model Lagrangian of vacuum space-time dynamics —including torsion and non-metricity.

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