

Lagrangians for differential equations of any order

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In this work the inverse problem of the variational calculus for systems of differential equations of any order is analyzed. It is shown that, if a Lagrangian exists for a given regular system of differential equations, then it can be written as a linear combination of the equations of motion. The conditions that these coefficients must satisfy for the existence of an S-equivalent Lagrangian are also exhibited. A generalization is also made of the concept of Lagrangian symmetries and they are related with constants of motion. © 1992 American Institute of Physics.