

Price, Richard H., and Kip S. Thorne. "Lagrangian vs Hamiltonian: The best approach to relativistic orbits." American Journal of Physics 86.9 (2018): 678-682

Compare equations of motion

- (1) Derive the expression (9).
- (2) Obtain the expression (14) from the Lagrangian description.

Hidden symmetry

- (1) Show that the quantity (B6) is an integral of motion using the Poisson brackets.

Hamiltonian approach with a non-diagonal metric

- (1) Obtain the Hamiltonian (C5) via Legendre transformation from the Lagrangian (C2).
- (2) Find a symmetry transformation corresponding to the conserved momentum (C3). Check that this symmetry gives the integral of motion (C3) via the Noether theorem.