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Symplectic reduction and its application in physics

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After the introductory course in symplectic geometry, we analyze symplectic manifolds which are symmetric under the action of a Lie group, leading in particular to the symplectic quotient construction. The important concept is the notion of the moment map, generalizing the concept of momentum and angular momentum in classical mechanics, and capturing all preserved quantities coming from Noethers theorem. The symplectic quotient, or Marsden-Weinstein quotient, allows then to define reduced phase spaces. We will see many examples both physically and mathematically motivated.

Key words: Hamiltonian actions, moment maps, symplectic quotient, Noether theorem, Poisson manifolds

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