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Superintegrable systems in classical and quantum mechanics

A review is given of the present status of superintegrable systems, i.e. finite dimensional Hamiltonian systems with more integrals of motion than degrees of freedom. The emphasis is on conceptual questions and on recent developments such as the discovery of infinite families of superintegrable systems with integrals of motion of arbitrary order in the momenta. Quantum superintegrability is shown to be much richer than the classical one. In particular, Painleve transcendents appear as quantum superintegrable potentials. Connections with infinite dimensional integrable systems (the soliton equations) are stressed,in particular the existence of non-Abelian algebras of integrals of motion.