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## Superintegrability with and without separation of variables

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### **Abstract**

Superintegrable systems are characterized by the fact that they allow more integrals of motion than they have degrees of freedom. We shall review the theory of classical and quantum superintegrable systems with integrals of motion that are second order polynomials in the momenta. Such systems are typically multiseparable: they allow the separation of variables in the Schrödinger, or Hamilton Jacobi equation in more than one system of coordinates. We show how the situation changes when higher order integrals of motion are considered, or when the system involves velocity dependent forces or particles with spin.