Integral points via invariant theory

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Abstract

Mordell was the first to prove that every elliptic curve has finitely many integral points. The proof depends on an invariant-theoretic construction of integral points; he showed that each integral point on a fixed curve arises from a binary quartic form $f(x, y)$ representing 1, and this was enough to buy him finiteness. Similarly, the invariant theory of binary cubics leads to a construction of integral points on a corresponding variety. I will explain these and related results from a modern viewpoint, where the study of the integral points is viewed through the lens of rings parameterised by the representation in question.