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Degree programme

Degree programme	Thesis type
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Original title
Two-cover descent on hyperelliptic curves and generalizations

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Abstract of thesis
A curve over a field k is a smooth, projective, and absolutely irreducible 1-dimensional k-variety, whereas a hyperelliptic curve is a curve with an affine patch of the form y^2 = f(x), where f(x) is a polynomial of degree≥ 3 without repeated roots, and char(k) ≠ 2. According to a theorem by Faltings, for any curve C over Q of genus ≥ 2 there are at most finitely many rational points satisfying the equation of the curve C; the set of those points is denoted as C(Q). None of the proofs of Faltings' Theorem are effective, ie. they do not provide an algorithm that guarantees to find C(Q). In particular, finding C(Q) for a specific hyperelliptic curve happens to be a difficult task in general. In this Bachelor thesis I present a special case of the two-cover descent, that is an approach which can be used to demonstrate that the set C(Q) is empty if some favorable conditions are met. In further sections I discuss the possibility to generalize the method, so that it can determine whether a curve of the form y^3 = f(x) has no rational points. To do the above mentioned generalization I considered two possible approaches that mimic the two-cover descent in the cubic case; namely a factorization of f into two polynomials, and a factorization into three polynomials. The text is written so that it should be comprehensible to most bachelor students who have completed some abstract algebra courses, and are familiar with the notion of fields.

Number of pages	39
Language of the thesis	English
Year of publication	2024

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