Algebra Seminar

Restriction of Scalars, Chabauty's Method, and $\mathbb{P}^1 \smallsetminus \{0, 1\infty\}$.

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Abstract: For a number field K and a curve C/K, the Chabauty's method is a powerful p-adic tool for bounding/enumerating the set $C(K)$. The method typically requires that dimension of the Jacobian J of C is greater than the rank of $J(K)$. Since this condition often fails, especially when $[K : \mathbb{Q}]$ is large, several techniques have been proposed to augment Chabauty's method. For proper curves, Siksek introduced an analogue of Chabauty's method for the restriction of scalars $Res_{K/\mathbb{Q}}C$ that can succeed when the rank of $J(\mathcal{O}_{K,S})$ is as large as $[K : \mathbb{Q}] \cdot (\dim J - 1)$. Using an analogue of Chabauty's method for restrictions of scalars in the non-proper case, we study the power of this approach together with descent for computing $C = (\mathbb{P}^1 \smallsetminus \{0, 1, \infty\})(\mathcal{O}_{K,S})$. As an application, we show that if 3 splits completely in K then there are no solutions to the unit equation $x + y = 1$ with $x, y \in \mathcal{O}_K^\times$.

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