Exceptional Units from Geometry

Nicholas Triantafillou
Center for Communications Research - Princeton, USA
nicholas.triantafillou@gmail.com

We describe a geometric approach to construct explicit infinite families of number fields with large Lenstra constant (i.e. containing large sets of integers whose pairwise differences are units) and whose rings of integers contain many exceptional units. For example, by considering integral points on an appropriate model of the modular curve $X_1(11)$ punctured at its 5 rational points, we produce 80 infinite families of sextic number fields, each with Lenstra constant at least 6 and each containing at least 60 exceptional units. We will also discuss applications to studying torsion subgroups on elliptic curves over number fields.

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