Online Number Theory Seminar

21 October 2022. – 17:00-17:50

Andrej Dujella: High-rank elliptic curves with given torsion group

We present several methods for constructing elliptic curves with a given torsion group and high rank over $\mathbb{Q}$ and $\mathbb{Q}(t)$. One motivation for studying such curves comes from their application in Lenstra's elliptic curve factorization method. For some of the torsion groups, the constructions over $\mathbb{Q}(t)$ use elliptic curves induced by rational Diophantine triples, in particular, subtriples of parametric families of rational Diophantine sextuples. In finding curves over $\mathbb{Q}$ with a higher rank, we search for suitable specializations by using Mestre-Nagao sums and then (try to) compute the rank by available software, such as mwrank, Magma and ellrank in PARI/GP. We will also compare our results in the construction of infinite families of elliptic curves with large rank and given torsion with the recent heuristics by Park, Poonen, Voight and Wood concerning the upper bound for the rank of such families of elliptic curves.