

Title: Explicit Heegner points: Kolyvagin's conjecture and non-trivial elements in the Shafarevich-Tate group.

Abstract: Kolyvagin used Heegner points to associate a system of cohomology classes to an elliptic curve over \mathbf{Q} and conjectured that the system contains a non-trivial class. His conjecture has profound implications on the structure of Selmer groups. I will explain some new computational and theoretical evidence for Kolyvagin's conjecture. More precisely, using explicit computation of Heegner points over ring class fields, I will verify the conjecture for specific elliptic curves of rank two. I will also explain how Kolyvagin's conjecture implies that if the analytic rank of an elliptic curve is at least two then the \mathbf{Z}_p -corank of the corresponding Selmer group is at least two as well. Finally, using explicitly computed Heegner points, I will construct non-trivial classes in the Shafarevich-Tate group. This is joint work with Kristin Lauter and William Stein.