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Diophantine equations counting supersingular hyperelliptic curves

One way to generalize the notion of a supersingular elliptic curve to curves with higher genus is to consider an invariant called the a-number. For example, curves with the a-number 0 have ordinary Jacobians, and those with a-number equal to their genus have Jacobians isomorphic to a product of supersingular elliptic curves. In this talk we will show how the number of hyperelliptic curves with a given a-number is related to the number of low height solutions to a family of Diophantine equations over $\mathbb{F}_q[x]$. In the case of characteristic 3, we are able to prove exact formulas for the number of such solutions and find, among other things, that precisely $1/q$ hyperelliptic curves are not ordinary (when counted in a certain way). This is joint work with Derek Garton and Jeff Thunder.