Divisibility by 16 of class numbers in certain families of quadratic number fields

Abstract:

The density of primes $p \equiv 1 \pmod{8}$ (resp. $p \equiv 7 \pmod{8}$) such that the class number of $\mathbb{Q}(\sqrt{-p})$ (resp. $\mathbb{Q}(\sqrt{-2p})$) is divisible by $2^{k+2}$ is conjectured to be $2^{-k}$ for all positive integers $k$. The conjecture has been resolved for $k = 1$ by the Chebotarev Density Theorem. For the family of quadratic fields $\mathbb{Q}(\sqrt{-2p})$, we use methods of Friedlander and Iwaniec to prove the conjecture for $k = 2$. Moreover, we show that there are infinitely many primes $p$ for which the class number of $\mathbb{Q}(\sqrt{-p})$ is divisible by 16.

Host: Cristian Popescu

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