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Constants for Artin-like problems

For an integer $a(\neq 0, \pm 1)$ and a prime $p \nmid a$, the residual index of a mod p, denoted by $i_a(p)$, is the index of the subgroup $\langle a \rangle$ in the multiplicative group $(\mathbb{Z}/p\mathbb{Z})^\times$. The generalized Artin problem asks for establishing an asymptotic formula

$$\sum_{p \leq x} f(i_a(p)) \sim c_{f,a} \mathrm{li}(x),$$

as $x \to \infty$, for suitable arithmetic function $f(n)$, where $c_{f,a}$ is a constant depending on a and f. In 2012, Adam Felix and Ram Murty proved, under the assumption of GRH, a version of the generalized Artin problem, when $f(n)$ satisfies a certain growth condition. We apply the character sums method of Lenstra, Moree, and Stevenhagen to write the constant in the Felix-Murty theorem, when f is multiplicative, as a product indexed over primes times a correction factor. When $f(n)$ is the divisor function $d(n)$, the so-called Titchmarch divisor problem for Kummer fields, we explicitly compute this constant. This is joint work with Milad Fakhari.