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Value-Distribution of Logarithmic Derivatives of Real Quadratic Dirichlet L-functions over the Projective Line

Let $\mathbb{F}_q(t)$ be a rational function field over a finite field $\mathbb{F}_q$. To each monic irreducible polynomial D in $\mathbb{F}_q[t]$, we can attach a Kronecker symbol χ_D and this is a real quadratic Dirichlet character. We can then define the associated Dirichlet L-function $L(s, \chi_D)$ as some infinite Euler product which, thanks to the work of André Weil, is a polynomial with integer coefficients in the variable $T = q^{-s}$. In her 2019 thesis, Allysa Lumley studied distributions of values of these L-functions for $\mathrm{Re}(s) > \frac{1}{2}$, uncovering that they coincide with some probabilistic random models. Inspired by the seminal work of Yasutaka Ihara on Euler-Kronecker constants of global fields, we study analogous distributions for their logarithmic derivatives $L'(s, \chi_D)/L(s, \chi_D)$. We currently prove that the distribution of these quotients at $s = 1$ is well-approximated by some random model. Moreover, we show that this random model has exponential decay, implying that the distribution function associated with our random model admits a smooth density function. This is ongoing joint work with Amir Akbary (University of Lethbridge).