Shimura Degrees, New Modular Degrees, and Congruence Primes

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Almost 20 years ago, Wiles proved modularity of elliptic curves over Q; for an elliptic curve E over Q of conductor N, there is a non-constant map from the modular curve X0(N) to E. For some curve isogenous to E, the degree of this map will be minimal; this is the modular degree. The Jacquet-Langlands correspondence allows us to similarly parameterize elliptic curves by Shimura curves. In this case we have several different Shimura curve parameterizations for a given isogeny class. Even though elliptic curves over totally real number fields do not have a modular curve parameterization, Shimura curve parameterizations generalize to this case. This allows us to examine the relationship between Shimura degrees and congruences primes in the totally real number field setting. In this talk I will discuss these degrees and how to compute them. Further, I compare these degrees with D-new modular degrees and D-new congruence primes. The data indicates that there is a strong relationship between Shimura degrees, new modular degrees and congruence primes.