

Deciding Complex Feasibility by Reducing to Finite Fields

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We use an algorithm created by Koiran to decide the existence of complex roots for certain systems of polynomials. Koiran's algorithm is completely different from the usual methods of Grobner bases or resultants. Better still, assuming the Generalized Riemann Hypothesis, Koiran's result placed this problem in the Arthur-Merlin complexity class (just above NP). Koiran's algorithm involves checking for primes p (in a parametrized interval) for which the input system F has roots modulo p . We attempt to classify the primes for which F is satisfiable by various methods. In particular, by focussing on the Galois group of F , we find specific prime densities for dihedral Galois groups, and we find methods for determining prime densities for symmetric and alternating groups.