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Counting reducible, powerful, and relatively irreducible multivariate polynomials over finite fields

We present counting methods for some special classes of multivariate polynomials over a finite field, namely the reducible ones, the s-powerful ones (divisible by the sth power of a nonconstant polynomial), and the relatively irreducible ones (irreducible but reducible over an extension field). One approach employs generating functions, another one a combinatorial method. They yield exact formulas and approximations with relative errors that essentially decrease exponentially in the input size. This is joint work with Joachim von zur Gathen and Konstantin Ziegler.