On the classification of planar monomials

Robert Coulter
Department of Mathematical Sciences
University of Delaware

Abstract

Let f be a polynomial defined on the finite field $\mathbb{F}_q$ of order $q = p^e$ elements with p odd and e a positive integer. Then f is a *permutation polynomial* over $\mathbb{F}_q$ if it induces a bijection of the field under evaluation. We say f is a *planar polynomial* over $\mathbb{F}_q$ if the polynomial $\Delta_f(X, a) = f(X + a) - f(X)$ is a permutation polynomial for every non-zero $a \in \mathbb{F}_q$. Planar monomials, that is polynomials of the form X^n, were classified over fields of prime order in 1987. In this talk we use some sneaky tricks and a little algebra to classify planar monomials over fields of prime square order and show how these same tricks almost get us a whole lot more.