

On a Class of Permutation Polynomials

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Abstract

A polynomial $f(x)$ defined over a set A is called a **permutation polynomial** if $f(x)$ acts as a permutation over the elements of A . This is, if $f : A \rightarrow A$ is 1-1 and onto. We study the coefficients a and b that make polynomials of the form $F_{a,b}(x) = x^{\frac{p+1}{2}} + ax^{\frac{p+5}{6}} + bx$ a permutation polynomial, $a, b \in \mathbb{F}_q^\times$. We show that this family of polynomials is rich in permutations, and that the amount of permutation polynomials for any q is divisible by 6. Our approach in studying $F(x)$ is to use the division algorithm to consider $x = \alpha^n$ where $n = 6k + r, r = 0, \dots, 5$. If $F_{a,b}(x)$ is a permutation, this partitions \mathbb{F}_q^\times into 6 classes: $F_{a,b}(\alpha^{6k+r})$ for $r = 0, \dots, 5$.