

On the cardinality of the set of solutions to congruence equation associated with polynomial of degree eleven

ABSTRACT

Let p be a prime and $f(x, y)$ be a polynomial in $\mathbb{Z}_p[x, y]$. For $n > 1$, the exponential sums associated with f modulo a prime p is defined as $S(f; q) = \sum_{x \in \mathbb{F}_q} \chi(f(x)/q)$. It has been shown that the estimation of $S(f; p^n)$ depends on the cardinality of the set of solutions to the congruence equation associated with the polynomial. In order to estimate the p -adic sizes of common zeros of partial derivative polynomials associated with certain class of polynomial of degree eleven, the Newton polyhedron technique will be used. Then, the indicator diagram is constructed and analyzed. Hence, the estimation of the cardinality of the set of the solutions is determined.

Keyword: Cardinality; Indicator diagram; Newton polyhedron; p -adic sizes