

Cardinality of sets associated to certain degree seven polynomials

ABSTRACT

Let $f = f(x,y)$ be a function of two variables. Let q be an integer and let $S(f;q) = \sum_{x \pmod q} \chi_{f(x)/q}$, where the sum is taken over a complete set of residue modulo q . The value of $S(f;q)$ depends on the estimate of the cardinality $|V|$ of the following set $V = \{(x,y) \pmod q \mid f_x, f_y \equiv 0 \pmod q\}$ where f_x and f_y are the partial derivative of f with respect to x and y . In this paper, we discuss the cardinality, $|V|$ of the set of solutions for congruence equations of some special binary forms. Firstly we need to obtain the p -adic sizes of common zeros of the partial derivative polynomials by using Newton polyhedron technique. The polynomial that we consider is in the form of $f(x, y) = ax^7 + bx^6y + cx^5y^2 + sx + ty + k$.

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