An estimation of the p-adic sizes of common zeros of partial derivative polynomials of degree six

ABSTRACT

Let x=(x1,x2,...,xn) be a vector in Zn with Z ring of integers and q be a positive integer, f a polynomial in x with coefficient in Z. The exponential sum associated with f is defined as S(f;q)=x xmodqe((2´ if(x))/q) where the sum is taken over a complete set of residues modulo q. The value of S (f; q) depends on the estimate of cardinality |V|, the number of elements contained in the set V={xmodq|fxʃ 0modq} where fx is the partial derivatives of f with respect to x. To determine the cardinality of V, the p-adic sizes of common zeros of the partial derivative polynomials need to be obtained. In this paper, we estimate the p-adic sizes of common zeros of partial derivative polynomials of f(x,y) in Zp[x,y] with a sixth degree form by using Newton polyhedron technique. The polynomial is of the form f(x,y)=ax6+bx5y+cx4y2+sx+ty+k.

Keyword: Cardinality; Exponential sums; Newton polyhedron; p-adic sizes