Valence of Irreducible Polynomials over Rationals and over Finite Fields

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a joint work with

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Abstract

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We explore an extension of the algebra of polynomials on a single variable recently introduced in [1] by López-Permouth and Pallone, called algebras of m-nomials and entangled polynomials. We are motivated by the fact that there may exist non-trivial factorizations of irreducible polynomials within the context of entangled polynomials. We are interested in the notion of a positive integer n ($n \in \mathbb{Z}^+$) such that $f(x)$ $n-$nomial is reducible. The valence is the smallest $n \times n$ matrix such that it is possible to write the $f(x)$ $n-$nomial as the product of two nonunits in $K^n[x]$. The valence can also be infinity if no such n exists. It was shown in [1] that linear polynomials have infinite valence. We explore possible ways in which the degree of a polynomial can influence its valence. We present, as a key element, how the determinant of a polynomial, when viewed as an n-nomial via a finitistic representation also introduced in [1] helps determine the moment when irreducibility is lost. For this study, we focus on the cases when the underlying fields are rational or finite.

Keywords

Valence, Entangled Polynomial, m-nomial.

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References

[1] López-Permouth, S. R., & Pallone, A. H. (2023). Rings of entangled polynomials. Rendiconti del Circolo Matematico di Palermo Series 2, 72(3), 1823-1843.