TOPOLOGY AND FACTORIZATION OF POLYNOMIALS

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ABSTRACT. For any polynomial $P \in \mathbb{C}[X_1, X_2, ..., X_n]$, we describe a $\mathbb{C}$-vector space $F(P)$ of solutions of a linear system of equations coming from some algebraic partial differential equations such that the dimension of $F(P)$ is the number of irreducible factors of P. Moreover, the knowledge of $F(P)$ gives a complete factorization of the polynomial P by taking gcd's. This generalizes previous results by Ruppert and Gao in the case $n = 2$.

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