Giorgadze, G.; Khimshiashvili, G.
On the index of the gradient of a real invertible polynomial. (English. Russian original)
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Summary: We present a number of observations concerning the so-called invertible polynomials introduced and studied in a series of papers on mathematical physics and singularity theory. Specifically, we consider real versions of invertible polynomials and investigate invariants of the associated isolated hypersurface singularities. By the very definition, such a polynomial is weighted homogeneous and its gradient vector field \( \text{grad} f \) has an isolated zero at the origin; hence its index \( \text{ind}_0 \text{grad} f \) is well defined. This index, referred to as the gradient index of the polynomial, is our main concern. In particular, we give an effective estimate for the absolute value of the gradient index \( \text{ind}_0 \text{grad} f \) in terms of the weighted homogeneous type of \( f \) and investigate its sharpness. For real invertible polynomials in two and three variables, we give the whole set of possible values of the gradient index. As an application, in the case of three variables we give a complete list of possible topological types of Milnor fibres of real invertible polynomials, which generalizes recent results of L. Andersen on the topology of isolated real hypersurface singularities. In conclusion we present a few open problems and conjectures suggested by our results.

MSC:
05-XX Combinatorics
14-XX Algebraic geometry

Keywords:
weighted homogeneous polynomial; invertible polynomial; isolated hypersurface singularity; gradient vector field; mapping degree; moduli algebra; signature of quadratic form; Milnor fibre; link of singularity; Euler characteristic

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References:

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