

Canonical Weierstrass Representations for Minimal Surfaces in Four-dimensional Pseudo-Euclidean Spaces

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Weingarten surfaces in a three-dimensional pseudo-Euclidean space locally admit special principal parameters, namely canonical principal parameters, which are geometrically determined. A similar question is still open in the theory of surfaces in four-dimensional pseudo-Euclidean spaces, but minimal surfaces admit similar geometric parameters.

We study the differential geometry of minimal surfaces in four-dimensional Euclidean space with respect to canonical principal parameters in the following aspects: find canonical Weierstrass representations in terms of two holomorphic functions; theorem of Bonnet in terms of two functions (Gauss and normal curvature); relation between two pairs of holomorphic functions generating one and the same minimal surface. We also discuss these problems for space-like and time-like minimal surfaces in four-dimensional Minkowski space. Finally we consider some examples.