A Study of Special Weingarten Hypersurfaces in $\mathbb{R}^4$ with Spherical Foliations

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We investigate hypersurfaces in the Euclidean 4-space $\mathbb{R}^4$ that are foliated by portions of spheres and satisfy a Weingarten relation of the form $a\mathbb{K}_1 + b\mathbb{K}_2 + c\mathbb{K}_3 = d$, where a, b, c, and d are constants. In this relation, $\mathbb{K}_1$, $\mathbb{K}_2$, and $\mathbb{K}_3$ denote the mean curvature, the second curvature, and the Gauss–Kronecker curvature, respectively.