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On a Problem of Elementary Differential Geometry and the Number of its Solutions

If M and N are submanifolds of $\mathbb{R}^k$, and a, b are points in $\mathbb{R}^k$, we may ask for points $x \in M$ and $y \in N$ such that the vector $\vec{ax}$ is orthogonal to y's tangent space, and vice versa for $\vec{by}$ and x's tangent space. If M, N are compact, critical point theory is employed to give lower bounds for the number of such related pairs of points. Interestingly, we also employ the curvature theory of hypersurfaces in a pseudo-Euclidean space, where curvatures are not considered as real numbers, but as linear forms in the normal space of a point.

Keywords: Curves and surfaces, critical points, pseudo-euclidean distance.

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