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Note on the classification theorems of g -natural metrics on the tangent bundle of a Riemannian manifold (M, g)

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Abstract: In [7], it is proved that all g -natural metrics on tangent bundles of m -dimensional Riemannian manifolds depend on arbitrary smooth functions on positive real numbers, whose number depends on m and on the assumption that the base manifold is oriented, or non-oriented, respectively. The result was originally stated in [8] for the oriented case, but the smoothness was assumed and not explicitly proved. In this note, we shall prove that, both in the oriented and non-oriented cases, the functions generating the g -natural metrics are, in fact, smooth on the set of all nonnegative real numbers.

Keywords: Riemannian manifold, tangent bundle, natural operation, g -natural metric, curvatures

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