95e:53046 53C15 58F06 70H40

Gotay, Mark J. (1-HI)

On symplectic submanifolds of cotangent bundles. (English. English summary)

Lett. Math. Phys. **29** (1993), *no.* 4, 271–279.

This paper answers the question of when a symplectic submanifold S of a cotangent bundle T^*M is itself a cotangent bundle. This question arises, for example, in the Dirac constraint algorithm. Suppose that M has dimension m and S has codimension $2k$ in T^*M and that the tangent map restricted to the tangent spaces of S of the projection $\pi_M \colon T^*M \to M$ has constant rank n. The author states and proves an important special case which asserts that when $n = m - k$, S is necessarily a cotangent bundle locally. Several refinements of this theorem are presented where it can be concluded that S is a cotangent bundle globally, for example, where S is an affine subbundle of T^*M. The paper continues by considering the case $n > m - k$, it being impossible for S to be a symplectic submanifold if $n < m - k$. The main idea is that S can sometimes be thought of as the cotangent bundle of a quotient space of $\pi_M(S)$.

   The paper concludes with a variety of examples from relativity theory and the theory of Lie groups.   *Gerard Thompson* (1-TLD)