

2. J. Eells, Jr., *On the geometry of function spaces*, International Symposium on Algebraic Topology, pp. 303–308, Universidad Nacional Autónoma de México and UNESCO, Mexico City, 1958.
3. S. Lang, *Introduction to differential manifolds*, Interscience, New York, 1962.
4. C. B. Morrey, *Existence and differentiability theorems for variational problems for multiple integrals*, Partial Differential Equations and Continuum Mechanics, Univ. of Wisconsin Press, Madison, Wis., 1961.
5. ———, *Multiple integral problems in the calculus of variations and related topics*, Ann. Scuola Norm. Sup. Pisa **14** (1960), 1–61.
6. M. Morse, *The calculus of variations in the large*, Amer. Math. Soc. Colloq. Publ. Vol. 18, Amer. Math. Soc., Providence, R. I., 1934.
7. J. Moser, *On the regularity problem for elliptic and parabolic differential equations*, Partial Differential Equations and Continuum Mechanics, Univ. of Wisconsin Press, Madison, Wis., 1961.
8. L. Nirenberg, *On elliptic partial differential equations*, Ann. Scuola Norm. Sup. Pisa **13** (1959), 115–162.

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ON THE SOLUTIONS OF THE WAVE EQUATION IN A QUADRANT OF R^4

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The problem of Goursat in its various forms has been studied extensively for hyperbolic differential equations in two independent variables, while similar questions for the equations with more than two variables have received much less attention than they properly deserve. One finds simple problems which do not admit any solution, although the same problems in two dimensions are well proposed. Other examples show that solutions with “correct” data may produce a curve of singularity in the interior.² In this paper we study solutions of the wave equation

$$w_{xx} + w_{x_1'x_1'} + w_{x_2'x_2'} - w_{tt} = 0$$

in the quarter-space

$$Q^4: |t| < x, x > 0, -\infty < x' < \infty, (x' = (x_1', x_2')),$$

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² One of the examples was communicated to the author by F. John. That the problem with $w(X, 0) = 0$ and arbitrary values on C_+ may have no solution was pointed out by H. Lewy in a discussion. To both of them the author is greatly indebted.