

Vector Algebras and Potentials

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Green, in treating Laplace's equation, was the first to base integrating factors on solutions which are functions of the distance between two points. Other writers have extended the idea to equations of the hyperbolic and parabolic types and to damped equations. Riemann was the first to discover that in the case of a damped equation the Green potential should involve a Bessel function of the above mentioned distance. Hadamard² has extended the Green potential

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This paper constitutes a part of a theory of linear partial differential equations developed under the direction of E. W. TITT, and is one of a series of joint papers which present the parts of the theory which are common to all partial differential equations. The students listed as contributing authors, in the order mentioned, entered the work before the general theory began to materialize and took over the tremendous load of computation required when the knowledge of one equation contributed relatively little to the knowledge of another. In the order mentioned the assisting personnel, each working for approximately one year, have, over a period of years, kept the work up to date in the many types of equations to be covered which in turn has contributed to the development of the theory as a whole. The Office of Naval Research under contract with The University of Texas contributed to the support of the work during 1947-48 and 1949-50. Part of the work on this paper was done at Indiana University in 1952-53 under Army Ordnance contract DA-33-008 ORD-454.

² HADAMARD, J., *Lectures on Cauchy's Problem in Linear Partial Differential Equations*, New Haven: Yale University Press, 1923, Bk. II, Ch. III. Compare with T. Y. THOMAS & E. W. TITT, "On the Elementary Solution of the General Linear Differential Equation of the Second Order with Analytic Coefficients," *Journal de Mathématiques Pures et Appliquées*, Tome XVIII, 1939, pp. 217-248. The reader is referred to the former for a more complete bibliography of the subject.