

Such an addition might lead up to an explanation of the Church λ -quantifier, in terms of which, in connection with constants, all other quantifiers can be defined.

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Two-Dimensional Potential Problems Connected with Rectilinear Boundaries. By B. R. Seth. Allahabad, India, The Allahabad Law Journal Press, 1939. 118 pp.

This attractive little volume grew out of a course of lectures delivered by Dr. Seth at the University of Lucknow in 1939. It deals primarily with the application of the Schwarz-Christoffel transformation in the solution of several problems and potential theory and related fields of mathematical physics. Among the problems discussed are special cases of the problem of torsion of a long prism as well as the Saint-Venant flexure problem, and problems of ideal fluid flow around prisms.

The author restricts himself to rectilinear boundaries for which the Schwarz-Christoffel transformation allows mapping on a half-plane. By confining himself to rectangular regions, special triangular regions such as the equilateral triangle, the 90° , 60° , 30° triangles and other similar special regions, he is able to express the mapping and the solutions of the problems for them in terms of the classical elliptic functions. Among other regions considered is the "angle-iron," the region on the outside of a rectangle, and the L -section.

The book will be welcomed by workers in this field of mathematical physics, as well as by mathematicians who are interested in application of elliptic functions.

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Operational Methods in Applied Mathematics. By H. S. Carslaw and J. C. Jaeger. Oxford, Clarendon Press, 1941. 16+264 pp. \$5.00.

In May 1815 Simeon Denis Poisson read before the Paris Academy a memoir on the distribution of heat in solid bodies. Extracts from this memoir were at once published in the *Journal de Physique* and in the *Bulletin de la Société Philomathique*. The memoir was subsequently enlarged and became, perhaps, one of Poisson's favorites because in May 1821 the work was printed and distributed privately two years before its final publication in *Journal de l'École Polytechnique*, vol. 12, no. 19, pp. 1-162. Poisson here made, I think, the first use of the method of the inverse Laplace transformation. In an attempt to find the distribution of temperature in a uniform rod radiating at its ends he was led to two linear functional differential equa-

tions for the unknown function f in his general solution of the equation of the conduction of heat. To solve these equations Poisson formed two Laplacian integrals involving the function f , the argument of the exponential function being xz in one case and $-xz$ in the other. By an integration by parts, equations were found from the functional differential equations which led to the values of the integrals. Poisson then deduced the value of a Fourier integral involving the function f and finally derived f by means of the Fourier inversion formula. He gave indeed a formal derivation of the inversion formula for the Laplace integral, a formula which is usually written as an integral along a vertical line in the complex plane.

Poisson thus initiated a method which has been found particularly useful during the last forty years. When V. Pareto in 1892 used the multiplication theorem for Laplacian integrals to solve a type of integral equation and M. Lerch in 1892 proved the uniqueness theorem for the representation of a function by a Laplacian integral involving a continuous function f , the method became a powerful mathematical tool. Further progress was made in 1896 when H. Mellin gave a rigorous discussion of the inversion formula used by Poisson. In 1902 H. M. Macdonald used the inversion formula for the evaluation of some definite integrals and in 1903 Lerch made a similar application of his theorem when his work was republished in *Acta Mathematica*, volume 27. This volume happened to contain also an account of Fredholm's pioneer work on linear integral equations and so the men interested in integral equations became acquainted also with Lerch's work. Sketches of the method under discussion and its application to differential equations and the evaluation of definite integrals appeared in a Smith's Prize essay of 1905, in a report on integral equations and in a paper of 1910 on radioactive transformations. The subsequent history of the subject and its connection with the operational calculus of Heaviside is given in the historical introduction of the book under review. This book is particularly welcome now that the subject is widely taught because the exposition is good and there are numerous illustrative examples taken from the subjects of dynamics, electric circuits, the conduction of heat, hydrodynamics, electric waves and diffusion. There is also a large collection of examples to enable a student to develop his skill.

The appendices contain a proof of Lerch's theorem, a note on Bessel functions, a discussion of impulsive functions and a treatment of two-point boundary value problems for ordinary linear differential equations. There is also a table of Laplace transforms.

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