This reduces the study of the asymptotic behavior of the solutions of the original nonlinear equation to the study of the iteration of two explicit transformations. These are of simple enough analytic form to permit the use of graphical analysis with great effect. It is this approach which the author has exploited.

Equations of this quasi-linear type are of great interest from the theoretical point of view since they furnish a vital link between the well-regulated world of linearity and the chaotic universe of nonlinearity. It is therefore a valuable contribution to the theory of nonlinear differential equations to have the behavior of the solutions of an important class of these equations presented in as complete and systematic a fashion as is done by the author. References to rigorous proofs of results used in the text, which is aimed at the engineer who must use mathematics, rather than the mathematician who is poaching in the domain of the engineer, are given throughout, particularly to papers of Bilharz, Klotter, Hodapp, and Scholz.

The occurrence of retarded control, which introduces a time-lag in the exertion of the forcing term, gives rise to differential-difference equations in place of the conventional differential equation. There is a brief treatment of this phenomenon in this volume. Those interested in further discussion of the mathematical and engineering consequences of retardation may wish to refer to the papers of Minorsky, cf. Journal of Applied Physics vol. 19 (1948) pp. 332–338, where further references may be found.

The last part of the volume treats the problem of the control of a missile, a problem involving more than one degree of freedom.

The editors of the Princeton University Press are to be congratulated upon adding another attractive and interesting volume to their series on nonlinear mechanics.

RICHARD BELLMAN

Complex variable theory and transform calculus. By N. W. McLachlan. 2d ed. Cambridge University Press, 1953. 11+388 pp. $10.00.

This book is the second edition of a text first published in 1939 (reviewed in Bull. Amer. Math. Soc. vol. 47 (1941) pp. 8–10). The principal changes are in the early, function-theoretic part. The author says that his exposition should now be "rigorous enough for all but the pure mathematician (to whom the book is not addressed)." On the whole this claim seems justified, in some instances more than justified, as on p. 116 where the continuity of a particular entire function is elaborately discussed. There are still mathematical obscurities. For instance, the definition of regular makes $z^{3/2}$ regular at the origin; the explanation on p. 341 why a closed interval is used in the definition of uniform convergence is just plain wrong.

There are serious objections against the first three chapters of the book. These concern the choice of material and the manner of presentation. It is misleading to call "Introduction to Complex Variable Theory" what is really an introduction to the technique of Contour Integration. Even the student primarily interested in technical applications should be treated to a less narrow approach (e.g. conformal mapping should be discussed; it would even be useful in the present text). The beginner must find the book very hard to follow. It is badly organized: definitions of technical terms are sometimes not given ("phase," "index") or given in passing after their first use (behavior at ∞, O-notation). Basic results are barely mentioned in small print (Cauchy-Riemann equations, regularity of power series) or used without explicit mention (differentiability of rational functions) or hinted at obscurely (behavior near a pole).

On the other hand there are unnecessary repetitions, because results are not formulated explicitly for further reference, or are not referred to, even if formulated (discussion of change of path of integration). In the reviewer's opinion the book would be improved by replacing the first three chapters by a paragraph stating the principal theorems used and referring for their complete statement and proof to one of the many good textbooks of Complex Variables.

As soon as the author comes to his subject proper, the Laplace Transform, the book rapidly improves. The systematic treatment of the complex inversion formula for functions with branch points and the discussion of asymptotic series and approximations will have points of interest and novelty even for skilled contour-integrators.

The last two parts of the book deal, mathematically, with ordinary, linear differential equations with constant coefficients, with the telegraph equation and the diffusion equation. The main interest here lies in the very well chosen, technical examples, their complete solution and comparison with experiment. The "unaddressed pure mathematician," especially if he is connected with the teaching of engineers, should derive real enjoyment and benefit from eavesdropping on these discussions of engineering applications. The excellence of these portions of the book more than compensates for the shortcomings of the beginning.

It is a pity that the application of the Laplace transform to differential equations with variable coefficients or to other types of functional equations has not been illustrated at all.

W. H. J. FUCHS