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BOOK REVIEWS

WALKER, P. L., *The theory of Fourier series and integrals* (John Wiley & Sons, Chichester 1968), pp. viii + 192, 0 471 90112 1, £14.95.

This book offers an introduction to the theory of Fourier series and integrals which is not based on the Lebesgue integral. The first chapter gives some properties of the real and complex Fourier coefficients of what are called *finitely continuous* (FC) functions (bounded functions, which are continuous on $[0, 2\pi]$ except perhaps at a finite number of points), including for example Parseval's theorem and the convolution property; it has sections on the completeness of the trigonometric system and on mean-square approximation. In Chapter 2, which deals with the convergence of Fourier series, it is shown how a Lipschitz condition on an FC function at a point or in an interval leads respectively to convergence or uniform convergence of its Fourier series. There is a good discussion of the behaviour of the series near a discontinuity of f, including the Gibbs phenomenon, and it is shown that the Fourier series of a piecewise monotone FC function converges to $\frac{1}{2}\{f(x+)+f(x-)\}$. Du Bois Reymond's example of a continuous function with Fourier series divergent at a given point is also included.

Chapter 3 deals with harmonic functions and the Poisson integral, leading to the solution of the Dirichlet problem for the disc, which is then extended to other regions by means of analytic mappings; many readers will learn some complex analysis or hydrodynamics, or both! Next come a brief chapter on the conjugate series and a longer one on the Fourier integral. The Dirichlet problem in the upper half-plane is discussed, and the Hilbert transform of a Lipschitz function. The final chapter, on multiple Fourier series and integrals, gives a convergence theorem and an inversion theorem respectively, and also shows how to adapt du Bois Reymond's idea to yield an FC function which is zero in a neighbourhood of the origin in $\mathbb{R}^2$ but whose Fourier series diverges there. An appendix gives the prerequisite elementary analysis, including a good development of the Riemann integral, standard properties of continuous functions and uniform convergence, and a short section on double series and integrals.

The author has chosen to use FC functions for the sake of some applications, and also so that the treatment can correspond as far as possible to one which uses the Lebesgue integral. As a result, I feel that there are easier ways for an engineer to learn the rudiments of Fourier series; on the other hand, it should be possible for one who already knows about Fourier series to dip into the applications in later chapters, which are consistently interesting and informative. The whole book is well written and has good examples, both worked and for the reader. It could hardly be improved on for a mathematics student unless, of course, he is familiar with the Lebesgue integral.

There are many misprints, whose nature suggests that the page proofs were not re-read after correction, and a few mathematical slips, such as the confusion of max and min on page 179, line 12. Some of the misprints will cause difficulty, especially those which confuse the symbols $-$, $=$, $\neq$, $\pm$ or have multiplicity greater than one (e.g. in the displays near the centres of pages 24 and 175), and it hurts to find Riemann spelt as Reimann with probability $\frac{1}{2}$.

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SHIRVANI, M. and WEHRFRITZ, B. A. F. *Skew linear groups* (London Mathematical Society Lecture Note Series 118, Cambridge University Press, 1986), pp. 253, 0 521 33925 1, £15.

The theory of linear groups over commutative rings has been studied over a long period of time and much is now known. In contrast the theory of linear groups over division rings (skew