Tom M. Apostol Calculus, Volume 1. Blaisdell Publishing Company, 1961. xviii + 515 pages. $8.50.

Every month or so for the last few years a newly written calculus text comes out of press. The resulting profusion of books can be roughly divided into three classes. First, we find the text books whose only claims to originality are the numerical values occurring in their exercises; these books are only slight variations of texts which have been with us for years. Next, we have the books written by authors who are convinced that the conventional texts are merely glorified integral tables and who, therefore, produce a text containing mathematics rather than recipes. In the process however they find it necessary to invent a completely new set of symbols, making the book unpractical for physics and engineering students. Finally, we have the texts which use the conventional notations and terminology but stress mathematical rigour.

Anyone familiar with Tom Apostol's "Mathematical Analysis" (Addison Wesley 1957) could have predicted that his "Calculus" would fall in the third category. Such is the case, and I believe that Apostol's "Calculus" is equal or superior to any text presently available in this class.

Before discussing Chapter I which is undoubtedly the most original and interesting one, I want to remark that the presentation, the type and the paper are excellent and that the book is handsome though very heavy! The historical remarks which introduce most sections are enlightening and should make interesting reading for the student. An informal intuitive discussion usually precedes the rigorous treatment of the important or difficult concepts and theorems. In fact most of the hard proofs are relegated to starred sections which occur at the end of each chapter and can be omitted without disrupting the continuity of the presentation. Needless to say, the book does not stress drill and those who consider hundreds of problems on integration and differentiation a sine qua non for a calculus text will be disappointed. The exercises however are numerous and of varying difficulty; a large number of them will offer a challenge to most students.

Let me now turn to that part of the book which constitutes a real inovation for an elementary text. In Tom Apostol's "Calculus" integration is studied before differentiation. The book begins with a detailed intuitive and critical discussion of the concept of area and then, starting with step functions, proceeds to define carefully the definite integral of a bounded function on an interval. This theoretical development offers little difficulty, but the introduction of examples at this stage presents a major problem, as witness the evaluation of $\int_0^b x^p dx$ on page 66, which requires two and a half pages of non-trivial

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mathematics. With the notion of area now at his disposal the author defines the radian measure of an angle in terms of the area of the sector rather than the arc length as is usually done. This procedure is quite logical since at this early stage the concept of arc length has not been introduced; the study of rectifiable curves and arc length does in fact come much later (Chapter 6) where it is treated rigorously. The trigonometric functions are introduced next in the usual geometrical manner. Chapter 1 concludes with the proof that piecewise monotonic functions on an interval are integrable, and with a discussion of upper and lower integrals. This may seem rather ambitious for a first introduction to integration. However, the elegant, interesting and detailed presentation should help to encourage the good student to make the effort necessary to grasp the important ideas presented in this first chapter.

The remaining portion of the book is more traditional.

Chapter 2, entitled "Differential Calculus", contains an unusually good discussion of limits and continuity, an honest proof of the chain rule and a sound treatment of differentials.

Chapter 3 studies logarithmic, exponential and inverse trigonometric functions. The logarithm is defined by the integral formula.

Chapter 4 introduces differential equations. Chapters 5 and 6 treat analytical geometry making use of vector algebra. After a study of curves and surfaces the concept of arc length is given a rigorous treatment in some starred sections.

Chapters 7 and 8 deal with the Mean Value Theorem and some of its consequences.

Finally Chapter 9 studies sequence series and improper integral.

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J. Blakey and M. Hutton Engineering Mathematics. Philosophical Library, New York, 1960. 603 pages. $10.00.

As stated in the preface, this book is intended to cover the mathematical requirements for a degree in Engineering at most Universities. The authors emphasize computational methods rather than mathematical rigour, and, as is the case with many English texts, each chapter is provided with carefully worked examples. In addition, there are 588 problems, many taken from London University examinations, together with answers.