Ordinary Differential Equations, by Morris Tenenbaum and Harry Pollard. Harper and Row, 1963. ii + 808 pages. $10.75.

Here is yet another elementary text book on ordinary differential equations. The chief distinction of the present volume lies in its size - 808 pages on rather heavy paper. This alone will no doubt ensure a large volume of sales. (I have already been informed by the publishers that the first printing has essentially sold out.)

The text gives the impression of being a verbatim transcript of a series of classroom lectures; in fact the book is partitioned into 65 "Lessons". It ought perhaps to have been entitled "Do It Yourself Ordinary Etc.". If used in this manner, the book might be quite successful, but for my own taste there is far too much verbiage.

Here is a typical excerpt (page 207):

"You may be wondering what linear dependence and linear independence of a set of functions has to do with solving a linear differential equation of order n. It turns out that a homogeneous linear differential equation of order n has as many linearly independent solutions as the order of its equation [sic]. (For its proof, see Theorems 19.3 and 65.4.) If the homogeneous linear differential equation, therefore, is of order n, we must find not only n solutions but we must be sure that these n solutions are linearly independent. And as we shall show, the linear combination of these n solutions will be its true general solution. For instance, if we solved a fourth order homogeneous linear differential equation and thought the four functions x, $-2x$, $-3x$, $4x$ in Example 19.13-1 were its four distinct and different solutions, we would be very much mistaken. All of them can be included in the one solution $y = cx$. Hence we would have to hunt for three more solutions. On the other hand, the functions x and x^2 which we proved [earlier] were linearly independent ... could be two distinct solutions of a homogeneous linear differential equation of order two. In that event, the linear combination $c_1x + c_2x^2$ would be its general solution."

"Hence in solving an n^{th} order homogeneous linear differential equation, we must not only find n solutions, but must also show that they are linearly independent."

At this rate of exposition, it is not surprising that a general proof of linear independence of the family $\{x^k c^{\alpha_j x}\}$ is, after all, beyond the scope of the book, although two special cases are considered (on page 781!) via the Wronskian.

As to subject matter, the authors are to be commended for having included as much material as they have, in view of their style. The usual stuff is presented, but with rather more extensive applications than usual, e.g., Kepler's laws are shown to be equivalent to Newton's inverse square law. The book concludes with a brief (inasmuch as brevity is within the authors' powers) and standard obeisance to questions of existence and uniqueness.

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Modern Multidimensional Calculus, by M.E. Munroe. Addison-Wesley Publishing Co. Inc., 1963. viii + 392 pages.

The aim of the book is to present, primarily, a modern approach to calculus from the point of view of "calculus of variables". The text is intended for those who have had at least a semester of calculus and algebra, and further, who are of a mature calibre. It is the reviewer's contention that a modern approach is made; however some clarity is lost due to a little prolixity. The main objection to the presentation is that Chapter I puts the reader a little on the defensive by the use of f o g (read f circle g), and its ramifications. Nevertheless the care with which differentials are treated compensates for any misgivings one may have on Chapter I.

The insertion of a chapter (4) on Matrix and Linear Algebra is an admirable and relatively new idea, as many of the following chapters rely heavily on these methods for their exposition. A further modernising approach is the use of, and careful definition of, the concept of a manifold. Chapter 5, which is very well written, studies partial derivatives, relying to a great extent upon the idea of a differential and extending the discussion in a multidimensional manner to the K-dimensional manifold.

Worked exercises and practice examples are adequate, with answers supplied and many neat figures drawn throughout to supplement proofs and discussion. A word about Chapter 9 on Multiple Integrals may not go awry. The discussion on oriented manifolds and exterior products ($dx \wedge dy$) is elegantly presented, particularly the theorem on changes of variables in double integrals which has an easy extension to higher dimensions. Although one feels that some Widder-like clarity is lost, honours students would certainly benefit from this presentation.

Printing is attractive and the book does succeed in doing what it intended, namely, presenting a modern view of the calculus of many dimensions.

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