Mathematical Theory of Reliability. By R. E. Barlow and F. Proschan, with contributions by L. C. Hunter. Wiley, New York (1965). xiii+256 pp.

The authors have produced a scholarly monograph which deserves the attention not only of the specialist in reliability theory but of anyone interested in the application of probability theory to an extensive and important group of practical problems. One of the unifying themes is the concept of monotone failure rate, which turns out to be a special case of total positivity, a concept which has had extensive application in probability, statistics, economics, and mechanics. One appendix is devoted to properties of totally positive functions, and a second gives a statistical test for determining if a sample comes from a population having a monotone failure rate.

The introductory chapter gives an informative historical background and points out how several basic concepts previously introduced (e.g. interval reliability, pointwise availability, interval availability, etc.) are all special cases of the expected value of the payoff of a vector-valued random variable. Succeeding chapters deal with: failure distributions, maintenance policies (operating characteristics and optimization), stochastic models for systems having several states, redundancy optimization, and finally an extension of the work of von Neumann, Moore and Shannon on the construction of reliable systems from unreliable components.

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Theory of Ordinary Differential Equations. By R. H. Cole. Appleton-Century-Crofts, New York (1968). xi+273 pp.

This book provides a transition from the bag-of-tricks to the functional-analytic treatment of linear differential equations. It is accessible to students who know some matrix theory and calculus and is sufficiently self-contained that it could be used for self-teaching.

The author's use of the contraction mapping principle permits a relatively uncluttered presentation of basic existence theory. Similarly, results for n-th-order equations are elucidated by first treating, in matrix notation, systems of first order.

There are ten chapters, the first five of which are devoted to the existence and construction of solutions. (Except for the general existence theory the book treats only linear equations.) The constant-coefficient case is solved via the Jordan canonical form for matrices. The analytic-coefficient case is solved via power series.

The latter five chapters deal with boundary value problems. Chapter 6 (the longest) includes the most lucid treatment of Green's functions, on this level, of which I am aware. The spectral theory for self-adjoint equations is treated as an extension of that for matrices. There is a short chapter on Sturm–Liouville theory and a concluding chapter on the spectral theory for non self-adjoint equations, which depends on asymptotic results quoted from Langer's works.

Throughout the book the reader will find examples and exercises, which adequately exemplify the theory.

There are several places where a small amount of additional material would have increased the degree of self-containment significantly. To cite an obvious case, the reader is referred to Buck for the definition of a connected set in R^n. More serious is the omission of a proof of Ascoli's lemma; this is not a lengthy proof and its inclusion would close the main logical gap in the treatment of self-adjoint eigenvalue problems.

Finally, I would like to say that, in these days of careless editing, it is a pleasure to encounter a book such as this with its readable format and small number of typographical errors.

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Cours de Mathématiques du Premier Cycle. Par Jacques Dixmier. Gauthier-Villars, Paris, Tome I, (1967), 472 pp. Tome II (1968), 361 pp.

Comme le titre l'indique, ce cours s'adresse aux étudiants de Mathématiques-Physique du premier cycle des universités françaises et il couvre un programme officiel bien déterminé. L'ensemble des deux tomes contient un bloc important de sujets: algèbre, algèbre linéaire, analyse réelle et complexe, équations différentielles, géométrie analytique et géométrie différentielle des courbes et des surfaces. Dans le contexte nord-américain, on retrouverait ce contenu dans plusieurs manuels.

Les notions fondamentales d'opération, de fonction, de groupe et d'anneau, sont introduites avec le minimum indispensable à la compréhension du texte, ce qui n'empêche pas d'y trouver les démonstrations des lois d'associativité et de commutativité généralisées que l'on trouve rarement dans un manuel d'enseignement. Les nombres réels sont définis comme étant des classes d'équivalence de suites de Cauchy sur les nombres rationnels dans un court chapitre de sept pages.

La présentation de l'algèbre linéaire est géométrique; dans l'étude des transformations linéaires, les matrices n'interviennent que comme instrument de calcul. De plus, l'algébre linéaire est développée de façon à construire un outillage adéquat pour l'analyse. En particulier, les formes multilinéaires alternées seront utilisées pour l'étude des formes différentielles, leurs intégrales et leurs applications. La théorie de l'intégration pour les fonctions de plusieurs variables n'est pas facile, même pour les théories élémentaires de l'intégration. L'auteur a choisi de présenter, sans démonstration pour les parties délicates (et elles sont nombreuses), la partie de la théorie générale qui suffit pour donner "un sens" aux calculs courants. Les

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