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MODERN MATHEMATICS

AND ITS APPLICATIONS

MATHEMATICS

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Library of Congress Cataloging in Publication Data

GOLDSTEIN, LARRY JOEL.
Modern mathematics and its applications.

Includes indexes.
1. Mathematics—1961– I. Lay, David C., joint author. II. Schneider, David I., joint author.
III. Title.
QA37.2.G64 1980 510 79-20346
ISBN 0-13-595173-9

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Englewood Cliffs, N.J. 07632.
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Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

Editorial/production supervision by Nancy Milnamow
Interior design and cover design by Walter A. Behnke
Manufacturing buyer: Ed Leone
Photo researcher: Frances L. Orkin

PHOTO CREDITS

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PRENTICE-HALL OF INDIA PRIVATE LIMITED, *New Delhi*
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WHITEHALL BOOKS LIMITED, *Wellington, New Zealand*

Mathematics and Its Applications

This volume is one of a collection of texts for freshman and sophomore college mathematics courses. Included in this collection are the following.

Calculus and Its Applications, Second Edition by L. Goldstein, D. Lay, and D. Schneider. A text designed for a two-semester course in calculus for students of business and the social and life sciences. Emphasizes an intuitive approach and integrates applications into the development. Much expanded from the highly successful first edition.

Calculus and Its Applications, Brief Edition by L. Goldstein, D. Lay, and D. Schneider. Consists of the first eight chapters of the above book. Suitable for shorter courses.

Finite Mathematics and Its Applications by L. Goldstein and D. Schneider. A traditional finite mathematics text for students of business and the social and life sciences. Allows courses to begin with either linear mathematics (linear programming, matrices) or probability and statistics.

Modern Mathematics and Its Applications by L. Goldstein, D. Lay, and D. Schneider. A text for a two-semester course covering finite mathematics, precalculus, and calculus.

PREFACE

Many colleges and universities offer yearlong sequences devoted to a combined treatment of finite mathematics and calculus. Such "combined" courses are populated by students in a variety of nonphysical science disciplines, but most frequently by business students. The goal is to provide exposure to both finite mathematics and calculus, usually in preparation for a general statistics course. The present work is designed as a text for such a "combined" course.

In designing this book, we have incorporated both a wide range of topics from which an instructor may design a curriculum as well as a high degree of flexibility in the order in which the topics may be presented.

What, in our opinion, distinguishes this book from other texts is its student-oriented approach and its much more thorough treatment of calculus and its prerequisites. Our student-oriented approach manifests itself throughout and, in particular, in the following features:

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1. *Applications.* We have, wherever possible, motivated mathematical ideas by applications. The applications are realistic and often are based on real-life data. The reader may survey the variety of applications by turning to the Index of Applications on page xvii.

2. *Intuitive approach.* We develop mathematical ideas by generalizing from concrete examples. Furthermore, formal proofs are often replaced by informal justifications designed to enhance both understanding and intuition.

3. *Examples.* We have provided more worked examples than is customary (572). These examples often illustrate computational points and interesting applications. An instructor may wish to assign some of the examples as student reading. We have included most calculational details to ease the student's way.

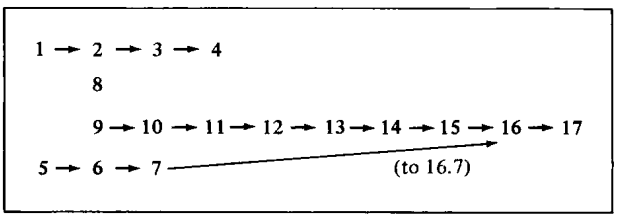
4. *Exercises.* Each section contains an extensive exercise set which illustrates and extends the material in the body of the text. Furthermore, each chapter has a review of new terms and a set of supplementary exercises. A total of 2458 exercises appear in the text.

5. *Practice Problems.* The practice problems are carefully selected exercises that are located at the end of each section, just before the exercise set. Complete solutions are given following the exercise set. The practice problems often focus on points that are potentially confusing or are likely to be overlooked. We recommend that the reader seriously attempt the practice problems and study their solutions before moving on to the exercises. In classroom use over the past three years, several thousand students have found practice problems to be a valuable learning aid.

6. *Minimal Prerequisites.* Because of great variation in student preparation, we have kept the formal prerequisites to a minimum. We assume only a first year of high school algebra. Furthermore, we review as needed those topics which are typical student weak spots.

A traditional shortcoming in existing texts is their sketchy treatment of calculus, as may be seen from the proportion of space devoted to calculus. Furthermore, preparation for the calculus often tends to be weak. In contrast, we have accorded approximately equal amounts of space to calculus and to finite mathematics and have given ample attention to precalculus topics.

This book contains sufficient material to teach a first semester of finite mathematics followed by a second semester of calculus. Actually, the text contains substantially more material than can be comfortably covered in many courses. So most instructors will use only a proper subset of the material we provide. The following chapter dependence chart should be helpful in choosing a curriculum based on this book.



Note that the finite mathematics component of this book primarily divides into two parts. The first consists of "linear mathematics"—linear equations, matrices, and linear programming (Chapters 1–4). The second part consists of probability and statistics (Chapters 5–7). We prefer to begin with linear mathematics since it makes for a smooth transition from high school mathematics and leads rather quickly to interesting applications, especially the linear programming. Our preference not withstanding, the instructor may begin the book with Chapter 5 (Sets and Counting). The final chapter of the finite mathematics component (Chapter 8) develops a single difference equation to present a unified treatment of interest, mortgages and annuities. This same difference equation can also be used to model various phenomena in sociology, biology, and economics.

It is our belief that the study of calculus should not be unduly delayed with prerequisites. Therefore, we have deliberately kept the precalculus chapter brief and to the point. It reviews exactly those topics which are necessary to begin learning calculus. Other precalculus topics are reviewed as needed.

The chapters on calculus are adapted from our widely-used text *Calculus and Its Applications* which was designed for a one year calculus sequence for business and the biological and social sciences. Our development of calculus is much more detailed and more leisurely than that in most existing books. Furthermore, our development of calculus of several variables, especially the method of Lagrange multipliers is both extensive and, as the experience of the users of *Calculus and Its Applications* has shown, is quite teachable.

Answers to the odd-numbered exercises are included at the back of the book. Answers to the even-numbered exercises are contained in the Instructor's Manual.

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ACKNOWLEDGMENTS

While writing this book, we have received assistance from many persons. And our heartfelt thanks goes out to them all. Especially, we should like to thank the following reviewers, who took the time and energy to share their ideas, preferences, and often their enthusiasm, with us.

Evan G. Houston, University of North Carolina, Charlotte; Richard Bouldin, University of Georgia; David H. Carlson, University of Missouri, Columbia; Marc Konvisser, Wayne State University; Kenneth N. Berk, Illinois State University; Rebecca Klemm, Georgetown University; Jack P. Tull, Ohio State University; James F. Hurley, University of Connecticut.

The staff of Prentice-Hall, Inc. has done a magnificent job of transforming a somewhat dog-eared, often ill-prepared manuscript into a beautiful bound volume. Especially, we should like to thank Susan Formilan for directing the traffic between the authors, reviewers, and publisher, Nancy Milnamow for her expertise as production editor, Robin Bartlett and Robyn Juback for their help in promotion and Walter Behnke for his imaginative and beautiful design work. Finally, we would like to express our gratitude to Harry Gaines, Executive Editor of Prentice-Hall, for favors too numerous to mention. His partnership, friendship, and constant encouragement have had a profound, positive effect on the ultimate form of this work.

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