FRANK S. BUDNICK

# APPLIED MATHEMATICS

## FOR BUSINESS, ECONOMICS, AND THE SOCIAL SCIENCES

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# PREFACE

**INTRODUCTION** Mathematics is an integral part of the education of students in business, economics, and the social sciences. There is increasingly a desire to improve the level of quantitative sophistication possessed by graduates in these types of programs. The objective is not to make mathematicians of these students, but to make them as comfortable as possible in an environment which increasingly makes use of quantitative analysis and the computer. Students are discovering that they must integrate mathematics, statistical analysis, and the computer in both required and elective courses within their programs. Furthermore, organizations are becoming more effective users of quantitative tools and the computer. Decision makers will be better equipped to operate within this type of environment if they are familiar with the more commonly used types of quantitative analyses and the technology of the computer. Such familarity can assist them in being better "critics" and "users" of these tools, and hopefully, better decision makers.

**DESIGN OF BOOK** This book is an applied mathematics book for students in business, economics, and the social sciences. It provides a comprehensive treatment of selected topics in both finite mathematics and calculus. Although intended principally for students in business and economics, the book is appropriate for students in the social sci-

ences. Designed primarily for a two-term course, the book can be adapted easily for a one-term course. It is appropriate for use in both two-year schools and four-year schools, as well as at the "foundation" level for graduate programs which require some mathematics background. M.B.A. and M.P.A. programs are typical graduate programs having this type of requirement.

Suggested course structures follow. For a two-term course, Term 1 would cover Chapters 0 to 9, while Term 2 would cover Chapters 10 to 16.

The first term is primarily a course in finite mathematics. Using Chapters 2 to 6 and 8 as a suggested core, Chapters 0, 1, 7, and 9 may be included depending upon the needs of students and the interest of the instructor. Chapters 0 and 1 should be included when students require a review of algebra and an introduction to set theory. Chapter 7 may be covered where a more complete coverage of linear programming is desired. Chapter 9 will probably be required for students in business and economics.

The second term is primarily an applied calculus course. Complete coverage of Chapters 10 to 15 is recommended; however, certain material may be excluded depending upon the needs and abilities of students.

The following are some suggested course structures for one-term courses:

A. **Emphasis on Calculus** A one-term course with emphasis on calculus would have a suggested core consisting of Chapter 2, Sections 5.1 to 5.2, and Chapters 10 to 15. Where students require a review of algebra and an introduction to set theory, Chapters 0 and 1 should be included.

B. **Emphasis on Finite Mathematics** A one-term course with emphasis on finite mathematics would select from among Chapters 0 to 9 and 16. Chapters may be included or excluded for the same reasons mentioned in the discussion of Term 1 of the two-term structure.

C. **Combination of Finite Mathematics and Calculus** A one-term course emphasizing both areas might have a variety of structures. A suggestion is that this type of course have a core which includes Chapters 2 to 5, 10 to 13, and 15. To this core may be added other chapters which expand the coverage of either area or both.

Specific features of this book are

**1 A level of presentation which carefully develops and reinforces topics.**

**2 A style which appeals to the intuition of students and provides a great deal of visual reinforcement (almost 250 figures).**

**3 An applied orientation which motivates students and provides a sense of purpose for studying mathematics (see table on pages xv to xviii indicating number and breadth of applications).**

**4 An approach which first develops the mathematical concept and then reinforces with applications.**

**5 An approach which minimizes the use of rigorous mathematical proofs. Proofs are included at the end of selected chapters for interested persons.**

**6 Special aids which address the most universal shortcoming of students entering this type of course: weak algebra skills. These aids include an optional chapter (Chapter 0) which reviews key algebra principles. A chapter pretest allows the student and instructor to identify areas requiring special attention. In addition, "Algebra Flashbacks" are used throughout the book to assist the student in the recall of key rules or concepts. The flashback usually consists of a restatement of a rule or concept with a reference to the appropriate section in Chapter 0.**

**7 Notes to students which provide them with special insights.**

**8 "Points for Thought and Discussion" which allow students to pause for a moment and reconsider a concept or example from a different perspective. Their purpose is to reinforce and extend the student's understanding.**

**9 A multitude of other learning aids including**

**almost 450 solved examples**

**a wealth of exercises (1761)**

**chapter tests**

**chapter objectives**

**end of chapter checklists**

**lists of key terms and concepts**

**summary lists of important formulas**

**10 An instructors manual which contains**

**answers for all exercises and tests**

**suggestions for different course structures**

**prototype examples for new applications**

**transparency masters for selected figures**

**a bank of questions for constructing quizzes and tests**

Although applications are presented throughout the book, Chapters 5 and 13 are devoted entirely to applications. The intent is that instructors cover as many applications in these chapters as they feel appropriate for their students. Chapter 14 (Classical Optimizations: Functions of Several Variables) is optional and not a prerequisite for Chapter 15 (Integral Calculus). Chapter 9 (Mathematics of Finance) has no prerequisite chapter. Except for the last part of Sec. 16.5, Chapter 16 (Introduction to Probability Theory) has no prerequisite chapters.

Some exercises in the book are considered to be of a high level of difficulty. These are preceded by an asterisk (*).

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Frank S. Budnick

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## APPLICATIONS*



* Explicitly labeled in the text.

APPLICATIONS