

Finite Mathematics

for Business, Economics, Life Sciences, and Social Sciences

THIRTEENTH EDITION

Raymond A. Barnett • Michael R. Ziegler • Karl E. Byleen



FINITE MATHEMATICS

FOR BUSINESS, ECONOMICS, LIFE SCIENCES, AND SOCIAL SCIENCES

Thirteenth Edition
Global Edition

RAYMOND A. BARNETT Merritt College

MICHAEL R. ZIEGLER Marquette University

KARL E. BYLEEN Marquette University



e Book Instant Access for Finite Mathematics for Business, Economics, Life Sciences and Social Sciences, Global Edition

Table of Contents

^	`	$\overline{}$	٠,	\sim	v
l	,	()	v	H	ı

Contents

Preface

Chapter Dependencies

Student Supplements

Instructor Supplements

Technology Resources

Diagnostic Prerequisite Test

Part 1: A Library of Elementary Functions

Chapter 1: Linear Equations and Graphs

1.1 Linear Equations and Inequalities

Linear Equations

Linear Inequalities

Applications

1.2 Graphs and Lines

Cartesian Coordinate System

Graphs of Ax + By = C

Slope of a Line

Equations of Lines: Special Forms

Applications

1.3 Linear Regression

Slope as a Rate of Change

Linear Regression

Chapter 1: Summary and Review

Review Exercises

Applications

Chapter 2: Functions and Graphs

2.1 Functions

Equations in Two Variables

Definition of a Function



Functions Specified by Equations

Function Notation

Applications

2.2 Elementary Functions: Graphs and Transformations

A Beginning Library of Elementary Functions

Vertical and Horizontal Shifts

Reflections, Stretches, and Shrinks

Piecewise-Defined Functions

2.3 Quadratic Functions

Quadratic Functions, Equations, and Inequalities

Properties of Quadratic Functions and Their Graphs

Applications

2.4 Polynomial and Rational Functions

Polynomial Functions

Regression Polynomials

Rational Functions

Applications

2.5 Exponential Functions

Exponential Functions

Base e Exponential Functions

Growth and Decay Applications

Compound Interest

2.6 Logarithmic Functions

Inverse Functions

Logarithmic Functions

Properties of Logarithmic Functions

Calculator Evaluation of Logarithms

Applications

Chapter 2: Summary and Review

Review Exercises

Applications

Part 2: Finite Mathematics

Chapter 3: Mathematics of Finance

3.1 Simple Interest

The Simple Interest Formula

Simple Interest and Investments

3.2 Compound and Continuous Compound Interest

Compound Interest

Continuous Compound Interest

Growth and Time



Annual Percentage Yield

3.3 Future Value of an Annuity; Sinking Funds

Future Value of an Annuity

Sinking Funds

Approximating Interest Rates

3.4 Present Value of an Annuity; Amortization

Present Value of an Annuity

Amortization

Amortization Schedules

General Problem-Solving Strategy

Chapter 3: Summary and Review

Review Exercises

Applications

Chapter 4: Systems of Linear Equations; Matrices

4.1 Review: Systems of Linear Equations in Two Variables

Systems of Linear Equations in Two Variables

Graphing

Substitution

Elimination by Addition

Applications

4.2 Systems of Linear Equations and Augmented Matrices

Matrices

Solving Linear Systems Using Augmented Matrices

Summary

4.3 GaussJordan Elimination

Reduced Matrices

Solving Systems by GaussJordan Elimination

Application

4.4 Matrices: Basic Operations

Addition and Subtraction

Product of a Number k and a Matrix M

Matrix Product

4.5 Inverse of a Square Matrix

Identity Matrix for Multiplication

Inverse of a Square Matrix

Application: Cryptography

4.6 Matrix Equations and Systems of Linear Equations

Matrix Equations

Matrix Equations and Systems of Linear Equations

Application



4.7 Leontief InputOutput Analysis

Two-Industry Model

Three-Industry Model

Chapter 4: Summary and Review

Review Exercises

Applications

Chapter 5: Linear Inequalities and Linear Programming

5.1 Linear Inequalities in Two Variables

Graphing Linear Inequalities in Two Variables

Application

5.2 Systems of Linear Inequalities in Two Variables

Solving Systems of Linear Inequalities Graphically

Applications

5.3 Linear Programming in Two Dimensions: A Geometric Approach

A Linear Programming Problem

General Description of Linear Programming

Geometric Method for Solving Linear Programming Problems

Applications

Chapter 5: Summary and Review

Review Exercises

Applications

Chapter 6: Linear Programming: The Simplex Method

6.1 The Table Method: An Introduction to the Simplex Method

Standard Maximization Problems in Standard Form

Slack Variables

The Table Method: Basic Solutions and Basic Feasible Solutions

Basic and Nonbasic Variables

Summary

6.2 The Simplex Method: Maximization with Problem Constraints of the Form

Initial System

Simplex Tableau

Pivot Operation

Interpreting the Simplex Process Geometrically

Simplex Method Summarized

Application

6.3 The Dual Problem: Minimization with Problem Constraints of the Form

Formation of the Dual Problem

Solution of Minimization Problems

Application: Transportation Problem

Summary of Problem Types and Solution Methods



6.4 Maximization and Minimization with Mixed Problem Constraints

Introduction to the Big M Method

Big M Method

Minimization by the Big M Method

Summary of Solution Methods

Larger Problems: Refinery Application

Chapter 6: Summary and Review

Review Exercises

Applications

Chapter 7: Logic, Sets, and Counting

7.1 Logic

Propositions and Connectives

Truth Tables

Logical Implications and Equivalences

7.2 Sets

Set Properties and Set Notation

Venn Diagrams and Set Operations

Application

7.3 Basic Counting Principles

Addition Principle

Venn Diagram

Multiplication Principle

7.4 Permutations and Combinations

Factorials

Permutations

Combinations

Applications

Chapter 7: Summary and Review

Review Exercises

Applications

Chapter 8: Probability

8.1 Sample Spaces, Events, and Probability

Experiments

Sample Spaces and Events

Probability of an Event

Equally Likely Assumption

8.2 Union, Intersection, and Complement of Events; Odds

Union and Intersection

Complement of an Event

Odds



Applications to Empirical Probability

8.3 Conditional Probability, Intersection, and Independence

Conditional Probability

Intersection of Events: Product Rule

Probability Trees

Independent Events

Summary

8.4 Bayes Formula

8.5 Random Variable, Probability Distribution, and Expected Value

Random Variable and Probability Distribution

Expected Value of a Random Variable

Decision Making and Expected Value

Chapter 8: Summary and Review

Review Exercises

Applications

Chapter 9: Markov Chains

9.1 Properties of Markov Chains

Introduction

Transition and State Matrices

Powers of Transition Matrices

Application

9.2 Regular Markov Chains

Stationary Matrices

Regular Markov Chains

Applications

Graphing Calculator Approximations

9.3 Absorbing Markov Chains

Absorbing States and Absorbing Chains

Standard Form

Limiting Matrix

Graphing Calculator Approximations

Chapter 9: Summary and Review

Review Exercises

Applications

Chapter 10: Games and Decisions

10.1 Strictly Determined Games

Strictly Determined Matrix Games

Nonstrictly Determined Matrix Games

10.2 Mixed-Strategy Games



Nonstrictly Determined Games: Example

Pure and Mixed Strategies

Expected Value of a Game

Fundamental Theorem of Game Theory

Solution to a 2 : 2 Matrix Game Recessive Rows and Columns

10.3 Linear Programming and 2: 2 Games: A Geometric Approach

10.4 Linear Programming and m: n Games: Simplex Method and the Dual Problem

Chapter 10: Summary and Review

Review Exercises

Applications

Chapter 11: Data Description and Probability Distributions

11.1 Graphing Data

Bar Graphs, Broken-Line Graphs, and Pie Graphs

Frequency Distributions

Comments on Statistics

Histograms

Frequency Polygons and Cumulative Frequency Polygons

11.2 Measures of Central Tendency

Mean

Median

Mode

11.3 Measures of Dispersion

Range

Standard Deviation: Ungrouped Data Standard Deviation: Grouped Data Significance of Standard Deviation

11.4 Bernoulli Trials and Binomial Distributions

Bernoulli Trials

Binomial Formula: Brief Review

Binomial Distribution

Application

11.5 Normal Distributions

Normal Distribution

Areas under Normal Curves

Approximating a Binomial Distribution with a Normal Distribution

Chapter 11: Summary and Review

Review Exercises

Applications

Appendix



Appendix A: Basic AlgebraReview

A.1 Real Numbers

Set of Real Numbers

Real Number Line

Basic Real Number Properties

Further Properties

Fraction Properties

A.2 Operations on Polynomials

Natural Number Exponents

Polynomials

Combining Like Terms

Addition and Subtraction

Multiplication

Combined Operations

A.3 Factoring Polynomials

Common Factors

Factoring by Grouping

Factoring Second-Degree Polynomials

Special Factoring Formulas

Combined Factoring Techniques

A.4 Operations on Rational Expressions

Reducing to Lowest Terms

Multiplication and Division

Addition and Subtraction

Compound Fractions

A.5 Integer Exponents and Scientific Notation

Integer Exponents

Scientific Notation

A.6 Rational Exponents and Radicals

nth Roots of Real Numbers

Rational Exponents and Radicals

Properties of Radicals

A.7 Quadratic Equations

Solution by Square Root

Solution by Factoring

Quadratic Formula

Quadratic Formula and Factoring

Other Polynomial Equations

Application: Supply and Demand

Appendix B: Special Topics

B.1 Sequences, Series, and Summation Notation



Sequences

Series and Summation Notation

B.2 Arithmetic and Geometric Sequences

Arithmetic and Geometric Sequences

nth-Term Formulas

Sum Formulas for Finite Arithmetic Series

Sum Formulas for Finite Geometric Series

Sum Formula for Infinite Geometric Series

Applications

B.3 Binomial Theorem

Factorial

Development of the Binomial Theorem

Appendix C: Tables

Table I Area under the Standard Normal Curve

Table II Basic Geometric Formulas

Answers

Index

Index of Applications

