



GLOBAL
EDITION



Calculus

for the Life Sciences

SECOND EDITION

Raymond N. Greenwell • Nathan P. Ritchey • Margaret L. Lial



ALWAYS LEARNING

PEARSON

Calculus for the Life Sciences

SECOND EDITION
GLOBAL EDITION

Raymond N. Greenwell

Hofstra University

Nathan P. Ritchey

Edinboro University

Margaret L. Lial

American River College

PEARSON

Boston Columbus Indianapolis New York San Francisco Upper Saddle River
Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montréal Toronto
Delhi Mexico City São Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

Calculus for the Life Sciences, Global Edition

Table of Contents

Cover

Title

Copyright

Contents

Preface

Prerequisite Skills Diagnostic Test

Chapter R Algebra Reference

R.1 Polynomials

R.2 Factoring

R.3 Rational Expressions

R.4 Equations

R.5 Inequalities

R.6 Exponents

R.7 Radicals

Chapter 1 Functions

1.1 Lines and Linear Functions

1.2 the Least Squares Line

1.3 Properties of Functions

1.4 Quadratic Functions; translation and Reflection

1.5 Polynomial and Rational Functions

Chapter 1 Review

Extended Application Using Extrapolation to Predict Life Expectancy

Chapter 2 Exponential, Logarithmic, and Trigonometric Functions

2.1 Exponential Functions

2.2 Logarithmic Functions

2.3 Applications: Growth and Decay

2.4 trigonometric Functions

Chapter 2 Review

Table of Contents

Extended Application Power Functions

Chapter 3 The Derivative

3.1 Limits

3.2 Continuity

3.3 Rates of Change

3.4 Definition of the Derivative

3.5 Graphical Differentiation

Chapter 3 Review

Extended Application A Model for Drugs Administered Intravenously

Chapter 4 Calculating the Derivative

4.1 Techniques for Finding Derivatives

4.2 Derivatives of Products and Quotients

4.3 The Chain Rule

4.4 Derivatives of Exponential Functions

4.5 Derivatives of Logarithmic Functions

4.6 Derivatives of Trigonometric Functions

Chapter 4 Review

Extended Application Managing Renewable Resources

Chapter 5 Graphs and the Derivative

5.1 Increasing and Decreasing Functions

5.2 Relative Extrema

5.3 Higher Derivatives, Concavity, and the Second Derivative Test

5.4 Curve Sketching

Chapter 5 Review

Extended Application A Drug Concentration Model for Orally Administered Medications

Chapter 6 Applications of the Derivative

6.1 Absolute Extrema

6.2 Applications of Extrema

6.3 Implicit Differentiation

6.4 Related Rates

6.5 Differentials: Linear Approximation

Chapter 6 Review

Table of Contents

Extended Application A total Cost Model for a Training Program

Chapter 7 Integration

7.1 Antiderivatives

7.2 Substitution

7.3 Area and the Definite Integral

7.4 The Fundamental Theorem of Calculus

7.5 The Area Between Two Curves

Chapter 7 Review

Extended Application Estimating Depletion Dates for Minerals

Chapter 8 Further Techniques and Applications of Integration

8.1 Numerical Integration

8.2 Integration by Parts

8.3 Volume and Average Value

8.4 Improper Integrals

Chapter 8 Review

Extended Application Flow Systems

Chapter 9 Multivariable Calculus

9.1 Functions of Several Variables

9.2 Partial Derivatives

9.3 Maxima and Minima

9.4 Total Differentials and Approximations

9.5 Double Integrals

Chapter 9 Review

Extended Application Optimization for a Predator

Chapter 10 Matrices

10.1 Solution of Linear Systems

10.2 Addition and Subtraction of Matrices

10.3 Multiplication of Matrices

10.4 Matrix Inverses

10.5 Eigenvalues and Eigenvectors

Chapter 10 Review

Extended Application Contagion

Chapter 11 Differential Equations

Table of Contents

11.1 Solutions of Elementary and Separable Differential Equations

11.2 Linear First-Order Differential Equations

11.3 Eulers Method

11.4 Linear Systems of Differential Equations

11.5 Nonlinear Systems of Differential Equations

11.6 Applications of Differential Equations

Chapter 11 Review

Extended Application Pollution of the Great Lakes

Chapter 12 Probability

12.1 Sets

12.2 Introduction to Probability

12.3 Conditional Probability; Independent Events; Bayes Theorem

12.4 Discrete Random Variables; Applications to Decision Making

Chapter 12 Review

Extended Application Medical Diagnosis

Chapter 13 Probability and Calculus

13.1 Continuous Probability Models

13.2 Expected Value and Variance of Continuous Random Variables

13.3 Special Probability Density Functions

Chapter 13 Review

Extended Application Exponential Waiting Times

Chapter 14 Discrete Dynamical Systems

14.1 Sequences

14.2 Equilibrium Points

14.3 Determining Stability

Chapter 14 Review

Extended Application Mathematical Modeling in a Dynamic World

Appendix

A Solutions to Prerequisite Skills Diagnostic Test

B Learning Objectives

C MathPrint Operating System for TI-84 and TI-84 Plus Silver Edition

D Tables

1 Formulas of Geometry

Table of Contents

2 Area Under a normal Curve

3 Integrals

4 Integrals Involving Trigonometric Functions

Answers to Selected Exercises

Credits

Index of Applications

Index

Sources