

Calculus from Graphical, Numerical, and Symbolic Points of View, 2e

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Chapter 1: Functions and Derivatives: The Graphical View

1. Functions, Calculus Style
2. Graphs
3. A Field Guide to Elementary Functions
4. Amount Functions and Rate Functions: The Idea of the Derivative
5. Estimating Derivatives: A Closer Look
6. The Geometry of Derivatives
7. The Geometry of Higher-Order Derivatives
8. Chapter Summary
9. Interlude: Zooming in on Differences

Chapter 2: Functions and Derivatives: The Symbolic View

1. Defining the Derivative
2. Derivatives of Power Functions and Polynomials
3. Limits
4. Derivatives, Antiderivatives, and Their Uses
5. Differential Equations; Modeling Motion
6. Derivatives of Exponential and Logarithm Functions; Modeling Growth
7. Derivatives of Trigonometric Functions; Modeling Oscillation
8. Chapter Summary
9. Interlude: Tangent Lines in History
10. Interlude: Limit—The Formal (ϵ - δ) Definition

Chapter 3: New Derivatives from Old

1. Algebraic Combinations: The Product and Quotient Rules
2. Composition and the Chain Rule
3. Implicit Functions and Implicit Differentiation
4. Inverse Functions and their Derivatives; Inverse Trigonometric Functions
5. Miscellaneous Derivatives and Antiderivatives
6. Chapter Summary
7. Interlude: Vibrations—Simple and Damped
8. Interlude: Hyperbolic Function

Chapter 4: Using the Derivative

1. Direction Fields; More on Growth and Motion
2. Limits Involving Infinity; l'Hôpital's Rule: Comparing Rates
3. More on Optimization
4. Parametric Equations
5. Related Rates
6. Newton's Method
7. Linear Approximation and Taylor Polynomials
8. Continuity
9. The Mean Value Theorem
10. Chapter Summary
11. Interlude: Growth with Interest
12. Interlude: Logistic Growth
13. Interlude: Digging Deeper for Roots (More on Newton's Method)

Chapter 5: The Integral

1. Areas and Integrals
2. The Area Function
3. The Fundamental Theorem of Calculus
4. Finding Antiderivatives by Substitution
5. Finding Antiderivatives Using Tables and Computers
6. Approximating Sums: The Integral as a Limit
7. Working with Approximating Sums
8. Chapter Summary
9. Interlude: Mean Value Theorems and Integrals

Chapter 6: Numerical Integration

1. Approximating Integrals: The Idea and Basic Methods.
2. Euler's Method for Differential Equations
3. Error Bounds

Chapter 7: Using the Integral

1. Interpretations of the Integral
2. Areas and Volumes
3. Motion; Work
4. Probability
5. Separable Differential Equations

Chapter 8: Symbolic Antidifferentiation Techniques

1. Integration by Parts
2. Partial Fractions
3. Trigonometric Antiderivatives
4. Miscellaneous Antidifferentiation Exercises

Chapter 9: Function Approximation

1. Taylor Polynomials
2. Taylor's Theorem
3. Fourier Polynomials

Chapter 10: Improper Integrals

1. When Is an Integral Improper?
2. Detecting Convergence; Estimating Limits

Chapter 11: Infinite Series

1. Sequences and Their Limits
2. Infinite Series, Convergence, and Divergence
3. Testing for Convergence; Estimating Limits
4. Absolute Convergence; Alternating Series
5. Power Series; Taylor Series
6. Algebra and Calculus with Power Series

Chapter V: Vectors and Polar Coordinates

1. Vectors
2. Polar Coordinates and Polar Curves
3. Calculus in Polar Coordinates

Chapter M: Multivariable Calculus: A First Look

1. Three-Dimensional Space
2. Functions of Several Variables
3. Partial Derivatives
4. Optimization and Partial Derivatives
5. Multiple Integrals and Approximating Sums
6. Calculating Multiple Integrals by Iteration
7. Summary and Review

Chapter 12: Curves and Vectors

1. Three-dimensional Space
2. Curves and Parametric Equations
3. Vectors
4. Vector-valued Functions, Derivatives, and Integrals
5. Derivatives, Antiderivatives, and Motion
6. The Dot Product
7. Lines and Planes in Three Dimensions
8. The Cross Product

Chapter 13: Derivatives

1. Functions of Several Variables
2. Partial Derivatives
3. Partial Derivatives and Linear Approximation
4. The Gradient and Directional Derivatives
5. Local Linearity: Theory of the Derivative
6. Higher Order Derivatives and Quadratic Approximation
7. Maxima, Minima, and Quadratic Approximation
8. The Chain Rule

Chapter 14: Integrals

1. Multiple Integrals and Approximating Sums
2. Calculating Integrals by Iteration
3. Double Integrals in Polar Coordinates
4. More on Triple Integrals; Cylindrical and Spherical Coordinates
5. Multiple Integrals Overviewed; Change of Variables

Chapter 15: Other Topics

1. Linear, Circular, and Combined Motion
2. Using the Dot Product: More on Curves
3. Curvature
4. Lagrange Multipliers and Constrained Optimization

Chapter 16: Vector Calculus

1. Line Integrals
2. More on Line Integrals; A Fundamental Theorem
3. Relating Line and Area Integrals: Green's Theorem
4. Surfaces and Their Parametrizations
5. Surface Integrals
6. Derivatives and Integrals of Vector Fields
7. Back to Fundamentals: Stokes' Theorem and the Divergence Theorem

Appendices

- A.** Machine Graphics
- B.** Real Numbers and the Coordinate Plane
- C.** Lines and Linear Functions
- D.** Polynomials and Rational Functions

- E.** Exponential and Logarithm Functions
- F.** Trigonometric Functions
- G.** Real-World Calculus: From Words to Mathematics
- H.** Selected Proofs
 - I.** A Graphical Glossary of Functions
 - J.** Complex Numbers
- K.** Matrices and Matrix Algebra: A Crash Course
- L.** Formulas, Identities, and Table of Integrals