
Contents

FOREWORD	vii
PREFACE	ix
SUGGESTIONS FOR SELF-INSTRUCTION	xi
CHAPTER 0. BACKGROUND MATERIAL	1
1. Sets	1
2. Real Numbers	10
3. Mathematical Induction	18
4. The Concept of a Function	23
5. Graphs of Functions	35
6. Algebraic Operations on Functions	48
7. Composite Functions and Inverse Functions	58
8. Two-Dimensional Analytic Geometry	68
9. Three-Dimensional Rectangular Coordinate System	89
10. Miscellaneous Problems	96
CHAPTER I. THE INTEGRAL AND DERIVATIVE	100
1. The Concept of Area	100
2. The Definite Integral	112
3. Monotonic Functions	130

4. The Derivative	139
5. Geometrical and Physical Meaning of Derivatives	154
6. Limits and Continuous Functions	164
7. Miscellaneous Problems	175
CHAPTER II. DIFFERENTIAL CALCULUS OF ALGEBRAIC FUNCTIONS	179
1. Derivatives of Sums, Products, and Quotients	179
2. Derivatives of Algebraic Functions	194
3. The Chain Rule	204
4. Mean Value Theorem	210
5. Maxima and Minima	223
6. Applications of the Second Derivative	237
7. Graph Sketching	251
8. Miscellaneous Problems	264
CHAPTER III. INTEGRAL CALCULUS OF ALGEBRAIC FUNCTIONS	267
1. Antiderivatives and Indefinite Integrals	267
2. Fundamental Theorem of Calculus	277
3. Integration by Substitution and by Parts	289
4. Improper Integrals	299
5. Numerical Methods for Definite Integrals	309
6. Taylor's Theorem	319
7. Miscellaneous Problems	331
CHAPTER IV. CALCULUS OF TRANSCENDENTAL FUNCTIONS	334
1. Logarithmic Functions	334
2. Exponential Functions	350
3. Review of Trigonometric Functions	363
4. Calculus of Trigonometric Functions	373
5. Inverse Trigonometric Functions	387
6. Hyperbolic Functions	402
7. Miscellaneous Problems	419
CHAPTER V. SYSTEMATIC SEARCH FOR ANTIDERIVATIVES	422
1. Partial Fractions	422
2. Antiderivatives of Rational Functions	432
3. Rationalization Methods	446
4. Trigonometric and Hyperbolic Substitutions	458
5. Products of Powers of $\sin(x)$ and $\cos(x)$	472
6. Applications of Integration by Parts	485
7. Miscellaneous Problems	494

CHAPTER VI. THEORY OF PLANE CURVES	497
1. Tangents and Normals	497
2. Implicit Representations of Curves	507
3. Parametric Representations of Curves	515
4. Polar Coordinates	526
5. Length of Curvilinear Arc	539
6. Curvature	549
7. Miscellaneous Problems	559
 CHAPTER VII. OTHER APPLICATIONS OF CALCULUS	 562
1. Related Rates	562
2. Indeterminate Forms	568
3. Differential Equations and Families of Curves	581
4. Solids and Surfaces of Revolution	587
5. Center of Mass	597
6. Work and Pressure	607
7. Miscellaneous Problems	612
 CHAPTER VIII. SEQUENCES AND SERIES	 614
1. Sequences	614
2. Infinite Series	626
3. Series of Positive Terms	632
4. Series with Some Negative Terms	642
5. Power Series	652
6. Operations with Power Series	664
7. Miscellaneous Problems	671
 APPENDIX I	 675
1. The ε - δ Language	675
2. Complex Numbers	685
 APPENDIX II. TABLES	 691
1. Powers and Roots of Integers n	692
2. Exponential Functions e^t and e^{-t}	693
3. Natural Logarithms $\ln t$	694
4. Common Logarithms $\log t$	696
5. Trigonometric Functions	698
6. Greek Alphabet	700

Answers to Selected Exercises	701
Special Symbols and Abbreviations	717
Index	719