
Contents

CHAPTER 1	Introduction to Calculus	
1.1	Velocity and Distance	1
1.2	Calculus Without Limits	8
1.3	The Velocity at an Instant	16
1.4	Circular Motion	22
1.5	A Review of Trigonometry	29
1.6	A Thousand Points of Light	34
1.7	Computing in Calculus	36
CHAPTER 2	Derivatives	
2.1	The Derivative of a Function	44
2.2	Powers and Polynomials	50
2.3	The Slope and the Tangent Line	58
2.4	Derivative of the Sine and Cosine	64
2.5	The Product and Quotient and Power Rules	71
2.6	Limits	78
2.7	Continuous Functions	85
CHAPTER 3	Applications of the Derivative	
3.1	Linear Approximation	91
3.2	Maximum and Minimum Problems	96
3.3	Second Derivatives: Minimum vs. Maximum	105
3.4	Graphs	112
3.5	Ellipses, Parabolas, and Hyperbolas	121
3.6	Iterations $x_{n+1} = F(x_n)$	130
3.7	Newton's Method and Chaos	137
3.8	The Mean Value Theorem and l'Hôpital's Rule	146

CHAPTER 4	The Chain Rule	
4.1	Derivatives by the Chain Rule	154
4.2	Implicit Differentiation and Related Rates	160
4.3	Inverse Functions and Their Derivatives	164
4.4	Inverses of Trigonometric Functions	171
CHAPTER 5	Integrals	
5.1	The Idea of the Integral	177
5.2	Antiderivatives	182
5.3	Summation vs. Integration	187
5.4	Indefinite Integrals and Substitutions	195
5.5	The Definite Integral	201
5.6	Properties of the Integral and the Average Value	206
5.7	The Fundamental Theorem and Its Consequences	213
5.8	Numerical Integration	220
CHAPTER 6	Exponentials and Logarithms	
6.1	An Overview	228
6.2	The Exponential e^x	236
6.3	Growth and Decay in Science and Economics	242
6.4	Logarithms	252
6.5	Separable Equations Including the Logistic Equation	259
6.6	Powers Instead of Exponentials	267
6.7	Hyperbolic Functions	277
CHAPTER 7	Techniques of Integration	
7.1	Integration by Parts	283
7.2	Trigonometric Integrals	288
7.3	Trigonometric Substitutions	294
7.4	Partial Fractions	300
7.5	Improper Integrals	305
CHAPTER 8	Applications of the Integral	
8.1	Areas and Volumes by Slices	311
8.2	Length of a Plane Curve	320
8.3	Area of a Surface of Revolution	325
8.4	Probability and Calculus	328
8.5	Masses and Moments	336
8.6	Force, Work, and Energy	342

CHAPTER 9	Polar Coordinates and Complex Numbers	
9.1	Polar Coordinates	348
9.2	Polar Equations and Graphs	351
9.3	Slope, Length, and Area for Polar Curves	356
9.4	Complex Numbers	360
CHAPTER 10	Infinite Series	
10.1	The Geometric Series	368
10.2	Convergence Tests: Positive Series	374
10.3	Convergence Tests: All Series	381
10.4	The Taylor Series for e^x , $\sin x$, and $\cos x$	385
10.5	Power Series	391
CHAPTER 11	Vectors and Matrices	
11.1	Vectors and Dot Products	398
11.2	Planes and Projections	407
11.3	Cross Products and Determinants	416
11.4	Matrices and Linear Equations	425
11.5	Linear Algebra in Three Dimensions	435
CHAPTER 12	Motion along a Curve	
12.1	The Position Vector	446
12.2	Plane Motion: Projectiles and Cycloids	453
12.3	Tangent Vector and Normal Vector	459
12.4	Polar Coordinates and Planetary Motion	464
CHAPTER 13	Partial Derivatives	
13.1	Surfaces and Level Curves	472
13.2	Partial Derivatives	475
13.3	Tangent Planes and Linear Approximations	480
13.4	Directional Derivatives and Gradients	490
13.5	The Chain Rule	497
13.6	Maxima, Minima, and Saddle Points	504
13.7	Constraints and Lagrange Multipliers	514

CHAPTER 14	Multiple Integrals	
14.1	Double Integrals	521
14.2	Changing to Better Coordinates	527
14.3	Triple Integrals	536
14.4	Cylindrical and Spherical Coordinates	541
CHAPTER 15	Vector Calculus	
15.1	Vector Fields	549
15.2	Line Integrals	555
15.3	Green's Theorem	563
15.4	Surface Integrals	573
15.5	The Divergence Theorem	582
15.6	Stokes' Theorem and the Curl of \mathbf{F}	589
CHAPTER 16	Mathematics after Calculus	
16.1	Linear Algebra	599
16.2	Differential Equations	603
16.3	Discrete Mathematics	611
	Study Guide For Chapter 1	G-0
	Answers to Odd-Numbered Problems	A-0
	Index	I-0
	Table of Integrals	T-0