UNIVERSIDAD NACIONAL DE ENTRE RIOS
FACULTAD DE INGENIERIA
CENTRO DE MEDIOS
BIBLIOTECA
Nº1 865

Contents

1 Plane Analytic Geometry

1.1 The Cartesian plane 1 **1.2** *Distance formula 3*
1.3 Point-of-division formulas 7 **1.4** *Inclination and slope 12*
1.5 Parallel and perpendicular lines 14 **1.6** *Graphs and points of intersection 17 Review problems 19*

2 Equations of Lines and Circles

2.1 Lines: point-slope and two-point forms 20
2.2 Lines: slope-intercept and intercept forms 24
2.3 Distance from a point to a line 29 **2.4** *The circle 34*
Review problems 38

3 Functions

3.1 Definition of a function 40 **3.2** *Functional expressions and combinations of functions 46* **3.3** *Introduction to limits 50*
Review problems 54

4 The Derivative

4.1 The slope of a curve 55 **4.2** *The derivative of a function 60* **4.3** *Derivative formulas: sum and product formulas 66* **4.4** *Derivative formulas: quotient rule and chain rule 71* **4.5** *Derivative formulas: power rule 80* **4.6** *Derivatives of implicit functions 83*
4.7 Multiple derivatives 87 Review problems 91

5 Curve Sketching

5.1 Intercepts and asymptotes 92 5.2 Symmetry, sketching 101 5.3 Radicals and the domain of the equation 108 5.4 Relative maxima and minima 112 5.5 Second-derivative test and points of inflection 118 5.6 End-point extrema 122 5.7 The derivative as an aid in sketching curves 126 Review problems 130

6 Further Applications of the Derivative

6.1 Applications of maxima and minima 132 6.2 Related rates 141 6.3 The differential 144 6.4 Applications to economics 150 6.5 Antiderivatives 154 Review problems 159

7 The Integral

7.1 Sigma notation 162 7.2 The area under a curve 167 7.3 The definite integral 174 7.4 The fundamental theorem of integral calculus 179 7.5 The integral as an antiderivative 184 7.6 The area between two curves 187 7.7 Work 192 7.8 Approximate integration 196 Review problems 202

8 Vectors in the Plane

8.1 Directed line segments and vectors 204 8.2 The dot product 209 8.3 Applications of vectors 214 Review problems 221

9 Conic Sections

9.1 Introduction 222 9.2 The parabola 222 9.3 The ellipse 226 9.4 The hyperbola 232 9.5 Translation 238 9.6 Rotation 245 9.7 Direct sketching of conics 251 Review problems 256

10 Limits and Continuity: A Geometric Approach

10.1 Limit points of the domain 257 10.2 The limit of a function 261 10.3 The limit of a function (continued) 264 10.4 One-sided limits 268 10.5 Infinite limits 271 10.6 Continuity 276 10.7 Limits, continuity, and derivatives 279 10.8 Derivatives of compound functions 288 Review problems 290

11 Trigonometric Functions

11.1 Graphs of trigonometric and inverse trigonometric functions 292 *11.2 Derivatives of trigonometric functions 297* *11.3 Integrals involving trigonometric functions 305* *11.4 Derivatives of inverse trigonometric functions 309* *11.5 Integrals involving inverse trigonometric functions 315* *Review problems 319*

12 Exponents, Logarithms, and Hyperbolic Functions

12.1 Exponential and logarithmic functions 321
12.2 Derivatives of logarithmic functions 325
12.3 Derivatives of exponential functions 331
12.4 Integrals involving logarithms and exponentials 335
12.5 Differential equations and rates of growth and decay 339
12.6 Utilization of natural resources 345 *12.7 Hyperbolic functions 352* *12.8 Integrals of hyperbolic functions 357*
12.9 Inverse hyperbolic functions 359 *Review problems 364*

13 Parametric Equations

13.1 Parametric equations 366 *13.2 Parametric equations of a locus 372* *13.3 Derivatives of parametric equations 376*
13.4 Arc length 379 *13.5 The catenary 384*
Review problems 388

14 Polar Coordinates

14.1 Polar coordinates 390 *14.2 Graphs in polar coordinates 391* *14.3 Points of intersection 397*
14.4 Relationships between rectangular and polar coordinates 399
14.5 Conics in polar coordinates 402 *14.6 Derivatives in polar coordinates 406* *14.7 Areas in polar coordinates 410*
Review problems 414

15 Methods of Integration

15.1 Fundamental formulas 416 *15.2 Integration by substitution 421* *15.3 Trigonometric integrals 426*
15.4 Trigonometric integrals (continued) 430
15.5 Trigonometric substitutions 434 *15.6 Integrals involving* $ax^2 + bx + c$ *440* *15.7 Integration by parts 444*
15.8 Partial fractions: linear factors 449 *15.9 Partial fractions: quadratic factors 454* *15.10 Miscellaneous substitutions 458*
15.11 Conclusion 462 *Review problems 462*

UNIVERSIDAD NACIONAL DE ENTRE RIOS
FACULTAD DE INGENIERIA
CENTRO DE MEDIOS
BIBLIOTECA

16 *Further Applications of the Integral*

16.1 Improper integrals 464 16.2 Volumes of solids of revolution: disc method 471 16.3 Volumes of solids of revolution: shell method 475 16.4 Volumes of other solids 479 16.5 Surfaces of revolution 484 16.6 Center of mass and moments 488 16.7 Centroids of plane regions 493 16.8 Centroids of solids of revolution 496 16.9 Centroids of arcs and surfaces 499 16.10 Moments of inertia 503 16.11 Fluid force 506 Review problems 510

17 *Limits and Continuity: The Epsilon-Delta Approach*

17.1 The limit 512 17.2 The limit (continued) 517 17.3 One-sided and infinite limits 521 17.4 Continuity 527 17.5 Rolle's theorem 532 17.6 The mean-value theorem 536 Review problems 540

18 *Indeterminate Forms*

18.1 The forms 0/0 and ∞/∞ 542 18.2 The forms $0\cdot\infty$ and $\infty-\infty$ 548 18.3 The forms $0^0, \infty^0$, and 1^∞ 551 Review problems 554

19 *Infinite Series*

19.1 Sequences and series 556 19.2 Series 566 19.3 The comparison and limit comparison tests 573 19.4 The ratio and integral tests 580 19.5 Alternating series and conditional convergence 586 19.6 Series of functions 593 19.7 Taylor's series 598 19.8 Remainder theorems 603 19.9 Differentiation and integration of series 609 Review problems 613

20 *Solid Analytic Geometry*

20.1 Introduction: the distance and point-of-division formulas 616 20.2 Vectors in space 620 20.3 Direction angles, cosines, and numbers 624 20.4 The line 629 20.5 The cross product 634 20.6 The plane 641 20.7 Distance between a point and a plane or line; angles between lines or planes 646 20.8 Cylinders and spheres 650 20.9 Quadric surfaces 653 20.10 Cylindrical and spherical coordinates 657 20.11 Curves in space; velocity and acceleration 662 Review problems 666

21 *Partial Derivatives*

21.1 Functions of several variables 668 21.2 The partial derivative 670 21.3 The chain rule 674 21.4 Implicit functions 680 21.5 The total differential and exact differentials 688 21.6 Approximation by differentials 692 21.7 Directional derivatives 694 21.8 Tangent plane to a surface; tangent line to a curve 701 21.9 Maxima and minima 708 21.10 Constrained maxima and minima 711 Review problems 715

22 *Multiple Integrals*

22.1 The double integral 717 22.2 Volume, area, and mass 725 22.3 Double integrals in polar coordinates 729 22.4 Centers of mass and moments of inertia 733 22.5 Triple integrals, volume and mass 739 22.6 Centers of mass and moments of inertia 745 22.7 Triple integrals in cylindrical and spherical coordinates 748 Review problems 755

Appendix

A *Absolute Values and Inequalities*

A.1 Inequalities 758 A.2 Absolute values 761 A.3 Absolute values and inequalities 763

B *Mean-Value Theorem*

B.1 Theorem 6.1 767 B.2 Theorem 5.5 768 B.3 Theorem 5.6 768 B.4 The fundamental theorem of integral calculus 770

C *Formulas*

C.1 Elementary algebra 771 C.2 Trigonometry 772 C.3 Mensuration formulas 773

D *Tables*

1 Squares, square roots, and prime factors 775 2 Common logarithms 776 3 Natural logarithms of numbers 778 4 Exponential functions 779 5 Trigonometric functions 780

Answers to Selected Problems 781

Index 841