CONTENTS

Chapter 1. The Theory of Determinants	1
 1.1 The solution of two simultaneous linear equations. 1.2 Properties of second order determinants. 1.3 The definition of a third order determinant. 1.4 Properties of third order determinants. 1.5 Fourth order determinants. 1.6 Factorization of symmetrical determinants. 1.7 The solution of homogeneous equations. 1.8 The solution of inhomogeneous equations. 	
Chapter 2. The Theory of Equations	25
 2.1 Polynomials. 2.2 The general polynomial equation. 2.3 Sums of powers of roots. 2.4 The formation of new equations. 2.5 Special methods for the solution of polynomial equations. 2.6 Repeated roots of polynomial equations. 2.7 The quadratic equation. 2.8 The cubic equation. 2.9 The quartic equation. 	
Chapter 3. The Theory of Finite and Infinite Series .	46
3.1 Methods for the summation of finite series. 3.2 The convergence of infinite series. 3.3 Tests for some special series. 3.4 Remarks on convergent series. 3.5 The ratio and comparison tests for convergence. 3.6 The binomial series. 3.7 Partial fractions and the binomial expansion. 3.8 The exponential and related series. 3.9 The logarithmic series.	
Chapter 4. Inequalities	80
4.1 Elementary observations. 4.2 Algebraical inequalities. 4.3 Quadratic forms. 4.4 Application to rational algebraical functions. 4.5 Application of the calculus to inequalities. 4.6 Arithmetic and geometric means.	
Chapter 5. Hyperbolic Functions	93
5.1 Definitions. 5.2 Various identities. 5.3 Problems concerning hyperbolic functions.	
Chapter 6. The Argand Diagram	102
 6.1 Complex numbers. 6.2 Representation of complex numbers. 6.3 Multiplication and division of complex numbers. 6.4 Geometrical problems in the Argand diagram. 6.5 Interpretation of loci in the Argand diagram. 	
Chapter 7. De Moivre's Theorem and Applications .	115
7.1 De Moivre's theorem.7.2 Roots of complex numbers.7.3 Roots of polynomials.7.4 The exponential form.7.5 Summation of trigonometrical series.7.6 Functions of a complex variable.	

7.7 Trigonometrical functions of multiple angles.7.8 Expansion in terms of functions of multiple angles.7.9 Simple transformations.7.10 The complex representation of harmonically varying quantities.	
CHAPTER 8. THE COORDINATE GEOMETRY OF THE STRAIGHT LINE AND THE CIRCLE	148
 8.1 Elementary results and revision. 8.2 The perpendicular distance from a point to a line. 8.3 Rotation of rectangular axes. 8.4 The intersection of two lines. 8.5 The area of a triangle. 8.6 The combined representation of two lines. 8.7 The representation of a circle. 8.8 Tangent properties. 8.9 The circumcircle of a triangle. 8.10 Systems of coaxal circles. 	
CHAPTER 9. THE THEORY OF CONICS	169
9.1 The intersection of a line and a conic.9.2 The central conic in its simplest form.9.3 The ellipse and the hyperbola.9.4 Some properties of the ellipse.9.5 Some properties of the hyperbola.9.6 The parabola.	
CHAPTER 10. THE GENERAL AND POLAR EQUATIONS OF THE CONIC	192
 10.1 Preliminary examination of the general equation. 10.2 The centre of a conic. 10.3 The axes of a conic. 10.4 The lengths of the axes. 10.5 The asymptotes of a hyperbola. 10.6 The parabola. 10.7 The straight line in polar coordinates. 10.8 The equation of the conic in polar coordinates. 	
CHAPTER 11. THE PLANE AND THE STRAIGHT LINE	207
11.1 Direction cosines. 11.2 The plane. 11.3 The intersection of three planes. 11.4 The straight line.	
Chapter 12. The Sphere and the Quadric	224
 12.1 The sphere. 12.2 Two spheres. 12.3 Spherical trigonometry. 12.4 Solution of spherical triangles. 12.5 The general quadric. 12.6 The simpler equation of the quadric. 12.7 The standard equations of the quadric. 	
CHAPTER 13. THE THEORY OF VECTORS	253
13.1 Definition of a vector. 13.2 The scalar product. 13.3 The vector product. 13.4 The triple products. 13.5 The motion of a charged particle in constant electric and magnetic fields.	
CHAPTER 14. DIFFERENTIATION AND ITS APPLICATIONS	270
14.1 Theorems on differentiation. 14.2 The differential coefficients of the elementary-functions. 14.3 Differential coefficients of the <i>n</i> th order. 14.4 Taylor's and Maclaurin's power series. 14.5 Application to series expansions. 14.6 Stationary values of functions of one	

variable. 14.7 Small increments and limits. 14.8 Newton's method for the approximate solution of equations. 14.9 Curvature in Cartesian coordinates. 14.10 Further considerations of curvature. 14.11 Curvature in polar coordinates. 14.12 Some special curves.	
CHAPTER 15. PARTIAL DIFFERENTIATION	320
 15.1 Partial derivatives. 15.2 The Taylor expansion of a function of two variables. 15.3 Change of variable in first order differential coefficients. 15.4 Change of variable in second order differential coefficients. 15.5 Small errors. 15.6 Stationary values. 15.7 Envelopes. 15.8 Tangent planes and normals to surfaces. 	
CHAPTER 16. INTEGRATION AND SOME APPLICATIONS	356
 16.1 Definition of an integral. 16.2 Standard forms for integration. 16.3 The use of algebraic and trigonometric identities. 16.4 Integration by change of variable. 16.5 Integration by parts. 16.6 Infinite integrals. 16.7 The logarithmic integral. 16.8 Simpson's rule for approximate integration. 16.9 Derivatives of parametric integrals. 16.10 Reduction formulae. 16.11 Various elements and their integrals. 	
CHAPTER 17. SIMPLE MULTIPLE INTEGRALS	399
17.1 Definitions. 17.2 Polar coordinates. 17.3 Change of variable.17.4 Triple integrals.	
Chapter 18. Fourier Series	415
 18.1 Some special integrals. 18.2 Fourier series of period 2π. 18.3 Half-range Fourier series. 18.4 Fourier series of general period. 18.5 Harmonic analysis. 	
CHAPTER 19. FIRST ORDER DIFFERENTIAL EQUATIONS	432
 19.1 Definitions. 19.2 Formation of differential equations. 19.3 Separable equations. 19.4 Exact equations. 19.5 Equations not of the first degree. 19.6 Linear first order equations. 19.7 Families of curves. 	
Chapter 20. Second Order Differential Equations .	453
20.1 Equations in which the independent variable is absent. homogeneous linear equation with constant coefficients. 20.3 The inhomogeneous equation. 20.4 Methods for finding the particular integral. 20.5 Change of the dependent variable. 20.6 Change of the independent variable. 20.7 Simultaneous differential equations. 20.8 An oscillatory system of one particle. 20.9 An oscillatory system of two particles. 20.10 Power-series solutions. 20.11 The Laplace transform. 20.12 The solution of differential equations. 20.13 Laplace transforms of some special functions.	

CHAPTER 21. THE SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS BY THE METHOD OF SEPARATION	
OF VARIABLES	495
21.1 The general solution of the wave equation. 21.2 The general theory of separated solutions. 21.3 The separated solutions for the wave equation. 21.4 The partial differential equation of heat conduction. 21.5 Steady heat flow in rectangular plates. 21.6 Timevarying heat flow in an insulated rod. 21.7 The diffusion equation.	475
CHAPTER 22. TOPICS IN ELEMENTARY STATICS	517
22.1 The equilibrium of a rigid body under a system of forces. 22.2 Shearing forces and bending moments. 22.3 The deflexion of a beam. 22.4 Theory of struts. 22.5 Revision notes on hydrostatics.	
CHAPTER 23. TOPICS IN ELEMENTARY AND ADVANCED DYNAMICS	545
23.1 Résumé of dynamical principles applied to a particle. 23.2 Motion in a resisting medium. 23.3 Rotation of a rigid body about a fixed axis. 23.4 The general motion of a lamina in a plane. 23.5 The impulsive motion of a lamina in a plane. 23.6 The equations of motion in polar coordinates. 23.7 Central orbits.	
Chapter 24. Statistics	586
 24.1 The mean. 24.2 Variance and standard deviation. 24.3 The combination of two sets of observations. 24.4 Frequency distributions. 24.5 Continuous distributions. 24.6 One fundamental problem of statistics. 24.7 The elements of probability theory. 24.8 The binomial distribution. 24.9 The Poisson distribution. 24.10 The normal distribution. 24.11 Sampling theory. 24.12 A note on quality control. 24.13 The method of least squares and correlation. 	
Chapter 25. Matrix Theory	621
25.1 Definitions. 25.2 Multiplication of matrices. 25.3 Applications of matrix notation. 25.4 Multiplication of determinants. 25.5 The reciprocal of a non-singular square matrix A. 25.6 Orthogonal matrices. 25.7 Rotation of rectangular axes. 25.8 Characteristic roots and vectors. 25.9 Properties of the roots and vectors. 25.10 Applications of characteristic roots and vectors. 25.11 Inconsistent linear equations.	
Chapter 26. Vector Analysis	655
 26.1 The gradient of a scalar function. 26.2 Line integrals. 26.3 Divergence of a vector field. 26.4 The curl of a vector field. 26.5 Solid angles. 26.6 Formal definitions. 26.7 The divergence theorem, Gauss's or Green's theorem. 26.8 Green's theorem. 26.9 Stokes' theorem. 	

INDEX