

CONTENTS

INTRODUCTORY REVIEW

CHAPTER I

REVIEW OF FUNDAMENTAL RULES

SECTION	PAGE
1. On differentiation	1
4. Logarithmic, exponential, and hyperbolic functions	4
6. Geometric properties of the derivative	7
8. Derivatives of higher order	11
10. The indefinite integral	15
13. Aids to integration	18
16. Definite integrals	24

CHAPTER II

REVIEW OF FUNDAMENTAL THEORY

18. Numbers and limits	33
21. Theorems on limits and on sets of points	37
23. Real functions of a real variable	40
26. The derivative	45
28. Summation and integration	50

PART I. DIFFERENTIAL CALCULUS

CHAPTER III

TAYLOR'S FORMULA AND ALLIED TOPICS

31. Taylor's Formula	55
33. Indeterminate forms, infinitesimals, infinites	61
36. Infinitesimal analysis	68
40. Some differential geometry	78

CONTENTS

CHAPTER IV

PARTIAL DIFFERENTIATION ; EXPLICIT FUNCTIONS		PAGE
SECTION		
43.	Functions of two or more variables	87
46.	First partial derivatives	93
50.	Derivatives of higher order	102
54.	Taylor's Formula and applications	112

CHAPTER V

PARTIAL DIFFERENTIATION ; IMPLICIT FUNCTIONS

56.	The simplest case ; $F(x, y) = 0$	117
59.	More general cases of implicit functions	122
62.	Functional determinants or Jacobians	129
65.	Envelopes of curves and surfaces	135
68.	More differential geometry	143

CHAPTER VI

COMPLEX NUMBERS AND VECTORS

70.	Operators and operations	149
71.	Complex numbers	153
73.	Functions of a complex variable	157
75.	Vector sums and products	163
77.	Vector differentiation	170

PART II. DIFFERENTIAL EQUATIONS

CHAPTER VII

GENERAL INTRODUCTION TO DIFFERENTIAL EQUATIONS

81.	Some geometric problems	179
83.	Problems in mechanics and physics	184
85.	Lineal element and differential equation	191
87.	The higher derivatives; analytic approximations	197

CHAPTER VIII

THE COMMONER ORDINARY DIFFERENTIAL EQUATIONS

89.	Integration by separating the variables	203
91.	Integrating factors	207
95.	Linear equations with constant coefficients	214
98.	Simultaneous linear equations with constant coefficients	223

CONTENTS

vii

CHAPTER IX

ADDITIONAL TYPES OF ORDINARY EQUATIONS

SECTION	PAGE
100. Equations of the first order and higher degree	228
102. Equations of higher order	234
104. Linear differential equations	240
107. The cylinder functions	247

CHAPTER X

DIFFERENTIAL EQUATIONS IN MORE THAN TWO VARIABLES

109. Total differential equations	254
111. Systems of simultaneous equations	260
113. Introduction to partial differential equations	267
116. Types of partial differential equations	273

PART III. INTEGRAL CALCULUS

CHAPTER XI

ON SIMPLE INTEGRALS

118. Integrals containing a parameter	281
121. Curvilinear or line integrals	288
124. Independence of the path	298
127. Some critical comments	308

CHAPTER XII

ON MULTIPLE INTEGRALS

129. Double sums and double integrals	315
133. Triple integrals and change of variable	326
135. Average values and higher integrals	332
137. Surfaces and surface integrals	338

CHAPTER XIII

ON INFINITE INTEGRALS

140. Convergence and divergence	352
142. The evaluation of infinite integrals	360
144. Functions defined by infinite integrals	368

CONTENTS

CHAPTER XIV

SPECIAL FUNCTIONS DEFINED BY INTEGRALS		PAGE
SECTION		
147.	The Gamma and Beta functions	378
150.	The error function	386
153.	Bessel functions	393

CHAPTER XV

THE CALCULUS OF VARIATIONS

155.	The treatment of the simplest case	400
157.	Variable limits and constrained minima	404
159.	Some generalizations	409

PART IV. THEORY OF FUNCTIONS

CHAPTER XVI

INFINITE SERIES

162.	Convergence or divergence of series	419
165.	Series of functions	430
168.	Manipulation of series	440

CHAPTER XVII

SPECIAL INFINITE DEVELOPMENTS

171.	The trigonometric functions	453
173.	Trigonometric or Fourier series	458
175.	The Theta functions	467

CHAPTER XVIII

FUNCTIONS OF A COMPLEX VARIABLE

178.	General theorems	476
180.	Characterization of some functions	482
183.	Conformal representation	490
185.	Integrals and their inversion	496

CONTENTS

ix

CHAPTER XIX

ELLIPTIC FUNCTIONS AND INTEGRALS

SECTION	PAGE
187. Legendre's integral I and its inversion	503
190. Legendre's integrals II and III	511
192. Weierstrass's integral and its inversion	517

CHAPTER XX

FUNCTIONS OF REAL VARIABLES

194. Partial differential equations of physics	524
196. Harmonic functions; general theorems	530
198. Harmonic functions; special theorems	537
201. The potential integrals	546
 BOOK LIST	555
INDEX	557

