

# Contents

<b>Preface</b> .....	vii
<b>A Note to the Reader</b> .....	xiii
<b>1 The Set of Real Numbers</b> .....	1
1.1 Sets and Mappings .....	1
1.2 The Set $\mathbf{R}$ .....	4
1.3 The Subset $\mathbf{N}$ and the Principle of Induction .....	9
1.4 The Completeness Property .....	16
1.5 Sequences and Limits .....	20
1.6 Nonnegative Series and Decimal Expansions .....	31
1.7 Signed Series and Cauchy Sequences .....	36
<b>2 Continuity</b> .....	49
2.1 Compactness .....	49
2.2 Continuous Limits .....	53
2.3 Continuous Functions .....	57
<b>3 Differentiation</b> .....	73
3.1 Derivatives .....	73
3.2 Mapping Properties .....	81
3.3 Graphing Techniques .....	88
3.4 Power Series .....	100
3.5 Taylor Series .....	106
3.6 Trigonometry .....	114
3.7 Primitives .....	122
<b>4 Integration</b> .....	131
4.1 The Cantor Set .....	131
4.2 Area .....	136

4.3	The Integral	151
4.4	The Fundamental Theorems of Calculus	168
4.5	The Method of Exhaustion	182
<b>5</b>	<b>Applications</b>	193
5.1	Euler's Gamma Function	193
5.2	The Number $\pi$	199
5.3	Gauss' Arithmetic-Geometric Mean	214
5.4	The Gaussian Integral	223
5.5	Stirling's Approximation	233
5.6	Infinite Products	240
5.7	Jacobi's Theta Functions	251
5.8	Riemann's Zeta Function	258
5.9	The Euler-Maclaurin Formula	268
<b>6</b>	<b>Generalizations</b>	277
6.1	Measurable Functions and Linearity	277
6.2	Limit Theorems	283
6.3	The Fundamental Theorems of Calculus	285
6.4	The Sunrise Lemma	292
6.5	Absolute Continuity	297
6.6	The Lebesgue Differentiation Theorem	304
<b>A</b>	<b>Solutions</b>	315
A.1	Solutions to Chapter 1	315
A.2	Solutions to Chapter 2	331
A.3	Solutions to Chapter 3	338
A.4	Solutions to Chapter 4	359
A.5	Solutions to Chapter 5	381
A.6	Solutions to Chapter 6	407
	<b>References</b>	419
	<b>Index</b>	421

Introduction to Calculus and Classical Analysis

Hijab, O.

2016, XIII, 427 p. 69 illus., 68 illus. in color., Hardcover

ISBN: 978-3-319-28399-9