

Contents

<i>Preface</i>	<i>xi</i>
<i>Acknowledgments</i>	<i>xiii</i>
<i>Introduction</i>	<i>xv</i>
1 Real Numbers and Functions	1
1.1 Field and Order Properties	1
1.2 Completeness Axiom and Archimedean Property	14
1.3 Functions	21
1.4 Real Functions and Graphs	27
Thematic Exercises	39
Curve Fitting: Interpolation and Least Squares	39
Cardinality	40
2 Integration	43
2.1 Integration of Step and Bounded Functions	45
2.2 Properties of Integration	54
2.3 Logarithm and Exponential Functions	64
2.4 Integration and Area	71
Thematic Exercises	77
Darboux Integral	77
3 Limits and Continuity	79
3.1 Limits	79
3.2 Continuity	91
3.3 Intermediate Value Theorem	97
3.4 Trigonometric Functions	101
3.5 Continuity and Variation	109
3.6 Continuity, Integration and Means	113
3.7 Limits Involving Infinity	116
Thematic Exercises	126
Continuity and Intervals	126

4 Differentiation	129
4.1 Derivative of a Function	129
4.2 Algebra of Derivatives	137
4.3 Chain Rule and Applications	141
4.4 The First Fundamental Theorem	151
4.5 Extreme Values and Monotonicity	153
4.6 Derivative Tests and Curve Sketching	159
Thematic Exercises	168
Convex Functions and Inequalities	168
5 Techniques of Integration	173
5.1 The Second Fundamental Theorem	173
5.2 Integration by Substitution	179
5.3 Integration by Parts	184
5.4 Partial Fractions	189
5.5 Improper Integrals	196
5.6 Ordinary Differential Equations	202
Thematic Exercises	214
Second Order Linear ODE	214
6 Mean Value Theorems and Applications	217
6.1 Mean Value Theorems	218
6.2 L'Hôpital's Rule	223
6.3 Taylor Polynomials	232
6.4 Riemann Sums and Mensuration	239
6.5 Numerical Integration	252
Thematic Exercises	260
Curve Fitting: Error Analysis	260
Riemann Integral	262
7 Sequences and Series	265
7.1 Limit of a Sequence	266
7.2 Sequences and Functions	276
7.3 Sum of a Series	284
7.4 Absolute and Conditional Convergence	293
Thematic Exercises	303
Stirling's Formula	303
Gamma and Beta Functions	304

Contents	ix
8 Taylor and Fourier Series	307
8.1 Power Series	307
8.2 Taylor Series	315
8.3 Fourier Series	321
8.4 Complex Series	333
Thematic Exercises	346
Uniform Convergence	346
Irrationality of Some Numbers	348
Appendix: Solutions to Odd-Numbered Exercises	351
<i>References</i>	383
<i>Index</i>	387