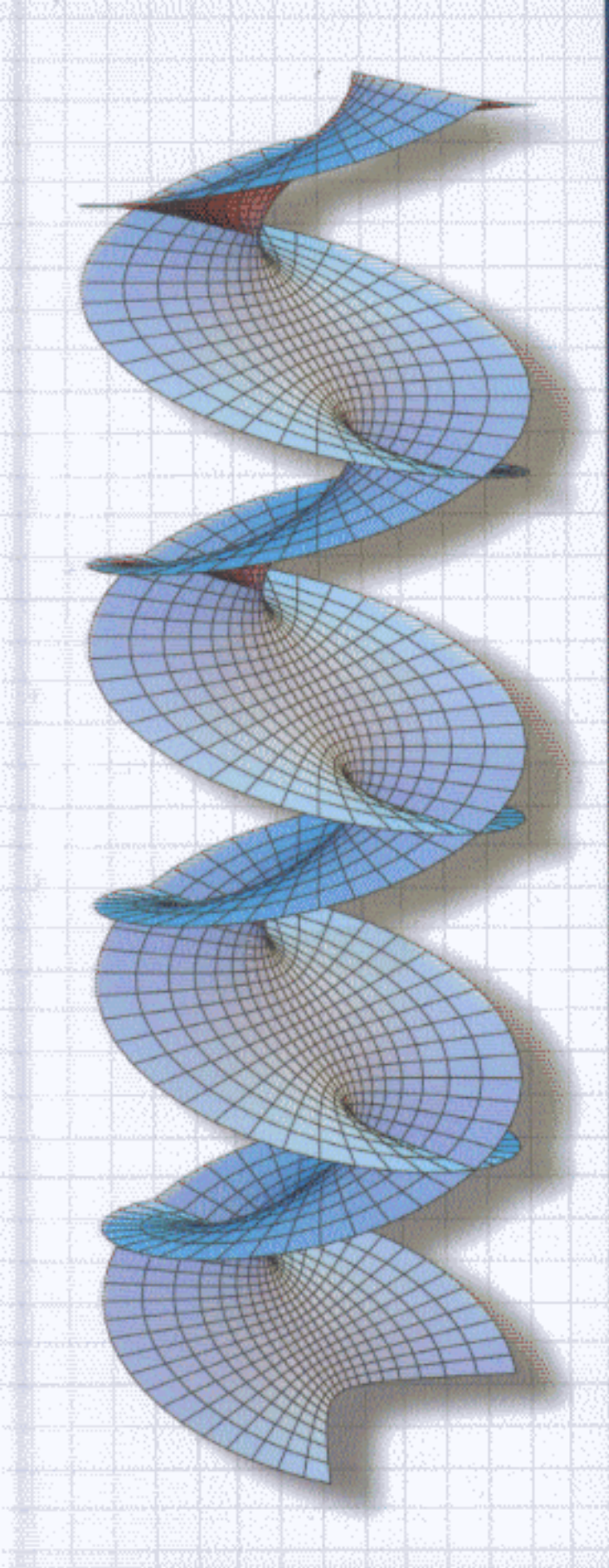




A First Course in

Complex Analysis

with Applications

Dennis G. Zill

Patrick D. Shanahan

JONES AND BARTLETT MATHEMATICS



Contents

Preface ix

Chapter 1.	Complex Numbers and the Complex Plane	1
1.1	Complex Numbers and Their Properties	2
1.2	Complex Plane	10
1.3	Polar Form of Complex Numbers	16
1.4	Powers and Roots	23
1.5	Sets of Points in the Complex Plane	29
1.6	Applications	36
	Chapter 1 Review Quiz	45
Chapter 2.	Complex Functions and Mappings	49
2.1	Complex Functions	50
2.2	Complex Functions as Mappings	58
2.3	Linear Mappings	68
2.4	Special Power Functions	80
	2.4.1 The Power Function z^n	81
	2.4.2 The Power Function $z^{1/n}$	86
2.5	Reciprocal Function	100
2.6	Limits and Continuity	110
	2.6.1 Limits	110
	2.6.2 Continuity	119
2.7	Applications	132
	Chapter 2 Review Quiz	138
Chapter 3.	Analytic Functions	141
3.1	Differentiability and Analyticity	142
3.2	Cauchy-Riemann Equations	152
3.3	Harmonic Functions	159
3.4	Applications	164
	Chapter 3 Review Quiz	172

Chapter 4.	Elementary Functions	175
4.1	Exponential and Logarithmic Functions	176
4.1.1	Complex Exponential Function	176
4.1.2	Complex Logarithmic Function	182
4.2	Complex Powers	194
4.3	Trigonometric and Hyperbolic Functions	200
4.3.1	Complex Trigonometric Functions	200
4.3.2	Complex Hyperbolic Functions	209
4.4	Inverse Trigonometric and Hyperbolic Functions	214
4.5	Applications	222
	Chapter 4 Review Quiz	232
 Chapter 5.	 Integration in the Complex Plane	 235
5.1	Real Integrals	236
5.2	Complex Integrals	245
5.3	Cauchy-Goursat Theorem	256
5.4	Independence of Path	264
5.5	Cauchy's Integral Formulas and Their Consequences	272
5.5.1	Cauchy's Two Integral Formulas	273
5.5.2	Some Consequences of the Integral Formulas	277
5.6	Applications	284
	Chapter 5 Review Quiz	297
 Chapter 6.	 Series and Residues	 301
6.1	Sequences and Series	302
6.2	Taylor Series	313
6.3	Laurent Series	324
6.4	Zeros and Poles	335
6.5	Residues and Residue Theorem	342
6.6	Some Consequences of the Residue Theorem	352
6.6.1	Evaluation of Real Trigonometric Integrals	352
6.6.2	Evaluation of Real Improper Integrals	354
6.6.3	Integration along a Branch Cut	361
6.6.4	The Argument Principle and Rouché's Theorem	363
6.6.5	Summing Infinite Series	367
6.7	Applications	374
	Chapter 6 Review Quiz	386

Chapter 7.	Conformal Mappings	389
7.1	Conformal Mapping	390
7.2	Linear Fractional Transformations	399
7.3	Schwarz-Christoffel Transformations	410
7.4	Poisson Integral Formulas	420
7.5	Applications	429
	7.5.1 Boundary-Value Problems	429
	7.5.2 Fluid Flow	437
	Chapter 7 Review Quiz	448
Appendixes:	I	Proof of Theorem 2.1 APP-2
	II	Proof of the Cauchy-Goursat Theorem APP-4
	III	Table of Conformal Mappings APP-9
	Answers for Selected Odd-Numbered Problems	ANS-1
	Index	IND-1