Contents



UNIVERSIDAD NACIONAL DE ENTRE RIOS
FACULTAD DE INGENIERIA
CENTRO DE MEDIOS
BIBLIOTECA

M1605

Preface xi

1 Complex Numbers

- 1.1 The Algebra of Complex Numbers 1
- 1.2 Point Representation of Complex Numbers;
 Absolute Value and Complex Conjugates
- 1.3 Vectors and Polar Forms 12
- 1.4 Powers and Roots 21
- 1.5 Planar Sets 25 Summary 28 Suggested Reading 29

2 Analytic Functions 30

- **2.1** Functions of a Complex Variable 30
- 2.2. Limits and Continuity 32

viii		
Conton	<i>t</i> c	

	2.3	Analyticity 38
	2.4	The Cauchy-Riemann Equations 44
		Harmonic Functions 50
	*2.6	Visualization of Harmonic Functions 54
		Summary 59
		Suggested Reading 60
3	Flo	ementary Functions 61
•	LIC	intentary runctions or
	3.1	The Exponential, Trigonometric, and Hyperbolic Functions
	3.2	
	3.3	
	*3.4	Application to Oscillating Systems 80

Summary Suggested Reading

Complex Integration 89

4.1	Contours	9
701	Comtours	7

4.2 Contour Integrals 102

4.3 Independence of Path

4.4 Cauchy's Integral Theorem

a. Deformation of Contours Approach 120

87

61

b. Vector Analysis Approach

4.5 Cauchy's Integral Formula and Its Consequences 142

4.6 Bounds for Analytic Functions

*4.7 Applications to Harmonic Functions 160 Summary 168 Suggested Reading 169

Series Representations for Analytic **Functions** 171

5.1 Sequences and Series

5.2 Taylor Series 177

5.3 Power Series 187

*5.4 Mathematical Theory of Convergence 196

5.5 Laurent Series 203

5.6 Zeros and Singularities 210

5.7 The Point at Infinity 220

*5.8 Analytic Continuation 224 Summary 235 Suggested Reading 236

6 Residue Theory 237

6.1 The Residue Theorem 237

6.2 Trigonometric Integrals Over $[0,2\pi]$

^{*} A star denotes sections which can be omitted without interrupting the logical flow.

ix	6.3	Improper Integrals of Certain Functions Over $(-\infty, \infty)$	248	
Contents	6.4	Improper Integrals Involving Trigonometric Functions	258	
		Indented Contours 265		S E
		Integrals Involving Multiple-Valued Functions 273		0
	*6.7		go r	7 - 0
		Summary 292	No.	2 E
		Suggested Reading 293	En C	5
			6	2 m 9
-	•	C 184		p mm. f
7	Co	nformal Mapping 294		000
	71	Invariance of Laplace's Equation 294	D	e z
		Geometric Considerations 301	6	100 mg
		Bilinear Transformations 309		RIOS
	514.00	Bilinear Transformations, Continued 320		00
		The Schwarz-Christoffel Transformation 330		
		Applications in Electrostatics, Heat Flow, and Fluid		
		Mechanics 342		
	7.7	Further Physical Applications of Conformal Mapping	356	
		Summary 365		
		Suggested Reading 366		
*8	B Fo	urier Series and Integral Transforms	368	
	0.4	T		
		Fourier Series 369		
		The Fourier Transform 384 The Laplace Transform 394		
	8.3	The Laplace Transform 394 Summary 404		
		Suggested Reading 406		
		Suggested Reading 400		
	Ap	pendix I Equations of Mathematical Physics 407		
		111/3103 407		
1 3	J.1	Electrostatics 407		
		Heat Flow 410		
	I.3	Fluid Mechanics 412		
*	10181	Suggested Reading 414		
		ins the winds through the report of the most place		
			ed autober	
	A	ppendix II Table of Conformal Mapping	s 415	
		to self-subsection and continue to the device the continue of between		
	II.1	Bilinear Transformations 416		
	П.2			
	1.	nswers to Selected Problems 421		
	A	13 44 61 3 10 0 0 10 0 10 0 1 1 0 0 10 11 10 11 11		

Index

437