CONTENTS

Preface	vi
Preface to the Second Edition	ij
Chapter 1: Introductory Ideas and Examples	
An easy two term recurrence	. :
A slightly harder two term recurrence	F
A three term recurrence	. 8
A three term boundary value problem	10
Two independent variables	11
Another 2-variable case	16
Exercises	24
Chapter 2: Series	
Formal power series	20
The calculus of formal ordinary power series generating functions	9 0
The calculus of formal exponential generating functions	აა 39
Power series analytic theory	39
Some useful nower series	$\frac{40}{52}$
Dirichlet series formal theory	$\frac{52}{56}$
	65
anter 3: Cards, Decks, and Hands: The Exponential Forms	la.
	ıa
Introduction	73
	74
Examples of exponential families	76
The main counting theorems	7 8
Permutations and their cycles	81
Set partitions	83
A subclass of permutations	84
Involutions, etc.	84
2-regular graphs	85
Counting connected graphs	86
Counting labeled bipartite graphs	87
Counting labeled trees	89
Exponential families and polynomials of 'binomial type.'	91
Unlabeled cards and hands	92
The money changing problem	96
	Chapter 1: Introductory Ideas and Examples An easy two term recurrence A slightly harder two term recurrence A three term recurrence A three term boundary value problem Two independent variables Another 2-variable case Exercises Chapter 2: Series Formal power series The calculus of formal ordinary power series generating functions The calculus of formal exponential generating functions Power series, analytic theory Some useful power series Dirichlet series, formal theory Exercises apter 3: Cards, Decks, and Hands: The Exponential Formu Introduction Definitions and a question Examples of exponential families The main counting theorems Permutations and their cycles Set partitions A subclass of permutations Involutions, etc. 2-regular graphs Counting connected graphs Counting labeled bipartite graphs Counting labeled trees Exponential families and polynomials of 'binomial type.' Unlabeled cards and hands

Vi		Contents
3.16	Partitions of integers	100
3.17	Rooted trees and forests	102
3.18	Historical notes	103
	Exercises	104
	Chapter 4: Applications of generating functions	
4.1	Generating functions find averages, etc.	108
4.2	A generating function ological view of the sieve method	110
4.3	The 'Snake Oil' method for easier combinatorial identities	118
4.4	WZ pairs prove harder identities	130
4.5	Generating functions and unimodality, convexity, etc	136
4.6	Generating functions prove congruences	140
4.7	The cycle index of the symmetric group	141
4.8	How many permutations have square roots?	146
4.9	Counting polyominoes	. 150
4.10	Exact covering sequences	154
	Exercises	157
	Chapter 5: Analytic and asymptotic methods	
5.1	The Lagrange Inversion Formula	167
5.2	Analyticity and asymptotics (I): Poles	171
5.3	Analyticity and asymptotics (II): Algebraic singularities	177
5.4	Analyticity and asymptotics (III): Hayman's method	. 181
	Exercises	188
	Appendix: Using $Maple^{TM}$ and $Mathematica^{TM}$	192
	Solutions	197
	References	224
	Index	227