CONTENTS IN DETAIL

INTRODUCTION	χv
So, What's Haskell?	χV
What You Need to Dive In	xvii
Acknowledgments	xviii
1	
STARTING OUT	1
Calling Functions	3
Baby's First Functions	5
An Intro to Lists	7
Concatenation	8
Accessing List Elements	9
Lists Inside Lists	
Comparing Lists	9
More List Operations	10
Texas Ranges	13
I'm a List Comprehension	15
Tuples	18
Using Tuples	19
Using Pairs	20
Finding the Right Triangle	21
2	
BELIEVE THE TYPE	23
Explicit Type Declaration	24
Common Haskell Types	25
Type Variables	26
Type Classes 101	27
The Eq Type Class	28
The Ord Type Class	28
The Show Type Class	29
The Read Type Class	
The Enum Type Class	
The Bounded Type Class	
The Num Type Class	
The Floating Type Class	
The Integral Type Class	
Some Final Notes on Type Classes	33

3 SYNTAX IN FUNCTIONS	35
Pattern Matching	
Pattern Matching with Tuples	
Pattern Matching with Lists and List Comprehensions	
As-patterns	40
Guards, Guards!	40
where?!	42
where's Scope	
Pattern Matching with where	
Functions in where Blocks	
let It Be	
let in List Comprehensions	
let in GHCi	
case Expressions	48
4	
HELLO RECURSION!	51
Maximum Awesome	
A Few More Recursive Functions	
replicate	
take	
reverse	
repeat	
zip	
elem	
Quick, Sort!	
The Algorithm	
The Code	
Thinking Recursively	58
5 HIGHER-ORDER FUNCTIONS	59
	_
Curried Functions	
Sections	
Printing Functions	
Some Higher-Orderism Is in Order	
Implementing zipWith	
Implementing flip	
The Functional Programmer's Toolbox	
The map Function	
The filter Function	
More Examples of map and filter	
Mapping Functions with Multiple Parameters	70

I Fold Y	ou So	73
	Left Folds with foldl	74
	Right Folds with foldr	75
	The foldl and foldr1 Functions	76
	Some Fold Examples	76
	Another Way to Look at Folds	
	Folding Infinite Lists	
	Scans	
Function	n Application with \$	
	Composition	
	Function Composition with Multiple Parameters	
	Point-Free Style	
6		
MOD		87
Importin	ng Modules	88
Solving	Problems with Module Functions	
	Counting Words	90
	Needle in the Haystack	
	Caesar Cipher Salad	
	On Strict Left Folds	
	Let's Find Some Cool Numbers	
Mappin	g Keys to Values	
	Almost As Good: Association Lists	
	Enter Data.Map	
Making	Our Own Modules	
	A Geometry Module	
	Hierarchical Modules	106
7	NG OUR OWN TYPES AND TYPE CLASSES	109
		_
	g a New Data Type	
Shaping	g Up	
	Improving Shape with the Point Data Type	
	Exporting Our Shapes in a Module	
	Syntax	
Type Pa	irameters	
	Should We Parameterize Our Car?	
5	Vector von Doom	
Derived	Instances	
	Equating People	
	Show Me How to Read	
	Order in the Court!	
	Any Day of the Week	126

Type Synonyms	
Making Our Phonebook Prettier	128
Parameterizing Type Synonyms	129
Go Left, Then Right	
Recursive Data Structures	
Improving Our List	
Let's Plant a Tree	135
Type Classes 102	
Inside the Eq Type Class	
A Traffic Light Data Type	
Subclassing	140
Parameterized Types As Instances of Type Classes	141
A Yes-No Type Class	143
The Functor Type Class	
Maybe As a Functor	
Trees Are Functors, Too	148
Either a As a Functor	149
Kinds and Some Type-Foo	
8 INPUT AND OUTPUT	153
Separating the Pure from the Impure	152
Hello, World!	
Gluing I/O Actions Together	
Using let Inside I/O Actions	
Putting It in Reverse	
Some Useful I/O Functions	
putStr	
putChar	
print	
when	
sequence	
mapM	
forever	
forM	
I/O Action Review	
9	
MORE INPUT AND MORE OUTPUT	169
Files and Streams	
Input Redirection	
Getting Strings from Input Streams	171
Transforming Input	1 <i>7</i> 3

Readin	ig and Writing Files	1 <i>75</i>
	Using the withFile Function	
	It's Bracket Time	1 <i>7</i> 8
	Grab the Handles!	
To-Do I	Lists	180
	Deleting Items	181
	Cleaning Up	
Commo	and-Line Arguments	
	Fun with To-Do Lists	
	A Multitasking Task List	
	Dealing with Bad Input	
Randor	mness	
	Tossing a Coin	
	More Random Functions	
	Randomness and I/O	
B∨testri	ings	
_,	Strict and Lazy Bytestrings	
	Copying Files with Bytestrings	
	, , ,	
10	CTIONALLY SOLVING PROBLEMS	203
Reverse	e Polish Notation Calculator	
	Calculating RPN Expressions	
	Writing an RPN Function	
	Adding More Operators	
Heathr	ow to London	
	Calculating the Quickest Path	
	Representing the Road System in Haskell	
	Writing the Optimal Path Function	
	Getting a Road System from the Input	215
11	ICATIVE FUNCTORS	017
	ICATIVE FUNCTORS	217
Functor	rs Redux	
	I/O Actions As Functors	
	Functions As Functors	
Functor	r Laws	
	Law 1	
	Law 2	
	Breaking the Law	
Using A	Applicative Functors	
	Say Hello to Applicative	
	Maybe the Applicative Functor	
	The Applicative Style	230

Lists		232
IO Is	An Applicative Functor, Too	234
Functi	tions As Applicatives	235
Zip Li	ists	237
	icative Laws	
Useful Function	ns for Applicatives	238
12		
MONOIDS	j	243
Wrapping an	Existing Type into a New Type	243
Using	g newtype to Make Type Class Instances	246
On no	ewtype Laziness	247
type v	vs. newtype vs. data	249
About Those N	Nonoids	250
The A	Monoid Type Class	252
	Monoid Laws	
	onoids	
	Are Monoids	
	uct and Sum	
	and All	
	Ordering Monoid	
	be the Monoid	
Folding with M	Monoids	262
13		
A FISTFUL	OF MONADS	267
Upgrading Ou	ur Applicative Functors	267
	eet Wet with Maybe	
	pe Class	
	e, Code, Code	
,	y Away	
	ına on a Wire	
	.s I Do	
	e Returns	
	rn Matching and Failure	
	d	
	lotation and List Comprehensions	
	adPlus and the guard Function	
	ight's Quest	
	dentity	
•	Identity	
٨ ـ	ciativity	294

14 FOR A FEW MONADS MORE	297
Writer? I Hardly Knew Her!	298
Monoids to the Rescue	
The Writer Type	
Using do Notation with Writer	
Adding Logging to Programs	
Inefficient List Construction	
Using Difference Lists	
Comparing Performance	
Reader? Ugh, Not This Joke Again	
Functions As Monads	
The Reader Monad	
Tasteful Stateful Computations	
Stateful Computations	
Stacks and Stones	
The State Monad	316
Getting and Setting State	318
Randomness and the State Monad	
Error Error on the Wall	321
Some Useful Monadic Functions	323
liftM and Friends	323
The join Function	326
filterM	328
foldM	331
Making a Safe RPN Calculator	332
Composing Monadic Functions	335
Making Monads	336
15 ZIPPERS	343
Taking a Walk	344
A Trail of Breadcrumbs	
Going Back Up	
Manipulating Trees Under Focus	
Going Straight to the Top, Where the Air Is Fresh and Clean!	
Focusing on Lists	
A Very Simple Filesystem	
Making a Zipper for Our Filesystem	
Manipulating a Filesystem	
Watch Your Step	
Thanks for Reading!	
INDEX	363