



The 30 Year Horizon

Manuel Bronstein James Davenport Albrecht Fortenbacher Jocelyn Guidry Michael Monagan Jonathan Steinbach Stephen Watt William Burge Michael Dewar Patrizia Gianni Richard Jenks Scott Morrison Robert Sutor Jim Wen

Timothy Daly
Martin Dunstan
Johannes Grabmeier
Larry Lambe
William Sit
Barry Trager
Clifton Williamson

Axiom Table of Contexts

Contents

Volume 0: Axiom Jenks and Sutor

Volume 1: Axiom Tutorial

Volume 2: Axiom Users Guide

Volume 3: Axiom Programmers GuideVolume 4: Axiom Developers Guide

Volume 5: Axiom InterpreterVolume 6: Axiom CommandVolume 7: Axiom Hyperdoc

Volume 7.1: Axiom Hyperdoc Pages

Volume 8: Axiom Graphics Volume 8.1: Axiom Gallery Volume 9: Axiom Compiler

Volume 10: Axiom Algebra: Implementation

Volume 10.1: Axiom Algebra: Theory Volume 10.2: Axiom Algebra: Categories Volume 10.3: Axiom Algebra: Domains Volume 10.4: Axiom Algebra: Packages Volume 10.5: Axiom Algebra: Numerics

Volume 11: Axiom Browser Volume 12: Axiom Crystal

Volume 13: Axiom Proving Axiom Correct

Bibliography: Axiom Bibliography

Volume 0: Axiom Jenks and Sutor

Contributors	3
Obituary – Richard Dimick Jenks	3
Obituary – James Griesmer	6
Obituary – Manuel Bronstein	8
	13
· · · · · · · · · · · · · · · · · · ·	15
Introduction to Axiom	1
1.0.1 Symbolic Computation	1
1.0.2 Numeric Computation	2
1.0.3 Graphics	2
1.0.4 HyperDoc	3
1.0.5 Interactive Programming	3
1.0.6 Data Structures	5
1.0.7 Mathematical Structures	6
1.0.8 Pattern Matching	7
1.0.9 Polymorphic Algorithms	7
1.0.10 Extensibility	8
1.0.10 Datempormey	
	11
1.1 Types are Defined by Abstract Datatype Programs	11
1.2 The Type of Basic Objects is a Domain or Subdomain	12
	12
1.4 Operations Can Refer To Abstract Types	12
	13
	13
	14
1.8 The Interpreter Builds Domains Dynamically	14
	15
	15
	15
	16
	17
	18
	20
	20
	21
	22
	$\frac{22}{25}$
	$\frac{25}{26}$
	26
	26
<u> </u>	20

		1.13.4	Comments and Descriptions	 			27
		1.13.5	Control of Result Types	 			27
	1.14	Data St	ructures in Axiom	 			28
		1.14.1		 			28
			Segmented Lists				34
		1.14.3	Streams	 			35
			Arrays, Vectors, Strings, and Bits				36
			Flexible Arrays				38
	1.15		ns, Choices, and Loops				40
			Reading Code from a File				40
			Blocks				40
		1.15.3	Functions	 			43
		1.15.4	Choices	 			45
		1.15.5	_ _oops	 			45
1	An		w of Axiom				1
	1.1		Up and Winding Down				1
			Clef				2
	1.2		aphic Conventions				3
	1.3		iom Language				3
			Arithmetic Expressions				3
			Previous Results				4
			Some Types				4
			Symbols, Variables, Assignments, and Declarations .				5
			Conversion				7
			Calling Functions				8
			Some Predefined Macros				9
			Long Lines				9
			Comments				9
	1.4		8				10
	1.5		ructures				15
	1.6		ing to Higher Dimensions				21
	1.7		Your Own Functions				22
	1.8		nials				26
	1.9						27
							28
			ves				30
		Integrat					32
			tial Equations				35
			of Equations				37
	1.15		Commands				39
			Undo				39
	1.16	Graphic	S	 			42

2	Usir	ng Types and Modes 45)
	2.1	The Basic Idea	í
		2.1.1 Domain Constructors	7
	2.2	Writing Types and Modes	_
		2.2.1 Types with No Arguments)
		2.2.2 Types with One Argument)
		2.2.3 Types with More Than One Argument	3
		2.2.4 Modes	3
		2.2.5 Abbreviations	}
	2.3	Declarations	í
	2.4	Records	7
	2.5	Unions)
		2.5.1 Unions Without Selectors)
		2.5.2 Unions With Selectors)
	2.6	The "Any" Domain	}
	2.7	Conversion	Į
	2.8	Subdomains Again	;
	2.9	Package Calling and Target Types	3
	2.10	Resolving Types	L
	2.11	Exposing Domains and Packages	3
	2.12	Commands for Snooping	í
3	Usir	ng HyperDoc 79)
	3.1	Headings	
	3.2	Key Definitions	
	3.3	Scroll Bars	
	3.4	Input Areas	-
	3.5	Radio Buttons and Toggles	-
	3.6	Search Strings	
		3.6.1 Logical Searches	
	3.7	Example Pages	
	3.8	X Window Resources for HyperDoc	;
4	T	it Files and Output Styles 85	
4	4.1		
	4.2		
	4.3	Common Features of Using Output Formats	
	4.4	Monospace Two-Dimensional Mathematical Format	
	4.5	TeX Format	
	4.6	IBM Script Formula Format	
	4.7	FORTRAN Format	,

5	Ove	rview of Interactive Language	93
	5.1	Immediate and Delayed Assignments	93
	5.2	Blocks	96
	5.3	if-then-else	98
	5.4	Loops	100
		5.4.1 Compiling vs. Interpreting Loops	100
		5.4.2 return in Loops	
		5.4.3 break in Loops	
		5.4.4 break vs. => in Loop Bodies	
		5.4.5 More Examples of break	
		5.4.6 iterate in Loops	
		5.4.7 while Loops	
		5.4.8 for Loops	
		5.4.9 for i in nm repeat	
		5.4.10 for i in nm by s repeat	
		5.4.11 for i in n repeat	
		5.4.12 for x in l repeat	
		5.4.13 "Such that" Predicates	
		5.4.14 Parallel Iteration	
		5.4.15 Mixing Loop Modifiers	
	5.5	Creating Lists and Streams with Iterators	
	5.6	An Example: Streams of Primes	
	0.0		
6		2 Delinea Tanetions, Materios ana Toures	119
	6.1	Functions vs. Macros	
	6.2	Macros	
	6.3	Introduction to Functions	
	6.4	Declaring the Type of Functions	
	6.5	One-Line Functions	
	6.6	Declared vs. Undeclared Functions	
	6.7	Functions vs. Operations	
	6.8	Delayed Assignments vs. Functions with No Arguments	
	6.9	How Axiom Determines What Function to Use	
		Compiling vs. Interpreting	
	6.11	Piece-Wise Function Definitions	
		6.11.1 A Basic Example	
		6.11.2 Picking Up the Pieces	
		6.11.3 Predicates	136
	6.12	Caching Previously Computed Results	137
	6.13	Recurrence Relations	138
	6.14	Making Functions from Objects	140
	6.15	Functions Defined with Blocks	143
	6.16	Free and Local Variables	145
	6.17	Anonymous Functions	150
		6.17.1 Some Examples	150
		6.17.2 Declaring Anonymous Functions	152

	6.18	Examp	ole: A Database	. 153
	6.19	Examp	ole: A Famous Triangle	. 155
			ole: Testing for Palindromes	
			and Pattern Matching	
7	Gra	\mathbf{phics}		165
	7.1	Two-D	Dimensional Graphics	. 166
		7.1.1	Plotting Two-Dimensional Functions of One Variable	. 166
		7.1.2	Plotting Two-Dimensional Parametric Plane Curves	. 167
		7.1.3	Plotting Plane Algebraic Curves	. 170
		7.1.4	Two-Dimensional Options	
		7.1.5	Color	
		7.1.6	Palette	
		7.1.7	Two-Dimensional Control-Panel	
		7.1.8	Operations for Two-Dimensional Graphics	
		7.1.9	Addendum: Building Two-Dimensional Graphs	
			Addendum: Appending a Graph to a Viewport Window Containing a	
		1.1.10	Graph	
	7.2	Three	Dimensional Graphics	
	1.4	7.2.1	<u>.</u>	
			Plotting Three-Dimensional Functions of Two Variables	
		7.2.2	Plotting Three-Dimensional Parametric Space Curves	
		7.2.3	Plotting Three-Dimensional Parametric Surfaces	
		7.2.4	Axiom Images	
		7.2.5	Three-Dimensional Options	
		7.2.6	The makeObject Command	
		7.2.7	Building Three-Dimensional Objects From Primitives	
		7.2.8	Coordinate System Transformations	
		7.2.9	Three-Dimensional Clipping	
		7.2.10	Three-Dimensional Control-Panel	
		7.2.11	Operations for Three-Dimensional Graphics	. 218
		7.2.12	Customization using .Xdefaults	. 221
8			Problem Solving	223
	8.1		ric Functions	
	8.2	Polyno	omial Factorization	
		8.2.1	Integer and Rational Number Coefficients	
		8.2.2	Finite Field Coefficients	
		8.2.3	Simple Algebraic Extension Field Coefficients	. 234
		8.2.4	Factoring Rational Functions	. 236
	8.3	Manip	ulating Symbolic Roots of a Polynomial	. 236
		8.3.1	Using a Single Root of a Polynomial	
		8.3.2	Using All Roots of a Polynomial	
	8.4	Compi	utation of Eigenvalues and Eigenvectors	
	8.5	_	on of Linear and Polynomial Equations	
		8.5.1	Solution of Systems of Linear Equations	
		8.5.2	Solution of a Single Polynomial Equation	

		8.5.3 Solution of Systems of Polynomial Equations	
	8.6	Limits	
	8.7	Laplace Transforms	
	8.8	Integration	
	8.9	Working with Power Series	
		8.9.1 Creation of Power Series	
		8.9.2 Coefficients of Power Series	
		8.9.3 Power Series Arithmetic	
		8.9.4 Functions on Power Series	
		8.9.5 Converting to Power Series	
		8.9.6 Power Series from Formulas	
		8.9.7 Substituting Numerical Values in Power Series	
		8.9.8 Example: Bernoulli Polynomials and Sums of Powers	
	8.10	Solution of Differential Equations	
		8.10.1 Closed-Form Solutions of Linear Differential Equations	
		8.10.2 Closed-Form Solutions of Non-Linear Differential Equations	
		8.10.3 Power Series Solutions of Differential Equations	
	8.11	Finite Fields	
		8.11.1 Modular Arithmetic and Prime Fields	
		8.11.2 Extensions of Finite Fields	
		8.11.3 Irreducible Modulus Polynomial Representations	
		8.11.4 Cyclic Group Representations	
		8.11.5 Normal Basis Representations	
		8.11.6 Conversion Operations for Finite Fields	
		8.11.7 Utility Operations for Finite Fields	
		Primary Decomposition of Ideals	
		Computation of Galois Groups	
	8.14	Non-Associative Algebras and Modelling Genetic Laws	304
9	Son	ne Examples of Domains and Packages	309
	9.1	ApplicationProgramInterface	
	9.2	ArrayStack	
	9.3	AssociationList	
	9.4	BalancedBinaryTree	
	9.5	BasicOperator	
	9.6	Binary Expansion	
	9.7	BinarySearchTree	
	9.8	CardinalNumber	
	9.9	CartesianTensor	325
		Character	333
		CharacterClass	
	9.12	CliffordAlgebra	
		9.12.1 The Complex Numbers as a Clifford Algebra	
		9.12.2 The Quaternion Numbers as a Clifford Algebra	338
		9.12.3 The Exterior Algebra on a Three Space	
		9.12.4 The Dirac Spin Algebra	341

9.13	Complex	342
9.14	ContinuedFraction	344
9.15	CycleIndicators	349
9.16	DeRhamComplex	357
	DecimalExpansion	
	Dequeue	
	DistributedMultivariatePolynomial	
	DoubleFloat	
	EqTable	
	Equation	
	Euclidean Groebner Basis Package	
	Exit	
	Expression	
	Factored	
3.20	9.26.1 Decomposing Factored Objects	
	9.26.2 Expanding Factored Objects	
	9.26.3 Arithmetic with Factored Objects	
	9.26.4 Creating New Factored Objects	
0.07	9.26.5 Factored Objects with Variables	
	FactoredFunctions2	
	File	
	FileName	
	FlexibleArray	
9.31	Float	
	9.31.1 Introduction to Float	
	9.31.2 Conversion Functions	
	9.31.3 Output Functions	
	9.31.4 An Example: Determinant of a Hilbert Matrix	
	Fraction	
	FullPartialFractionExpansion	
	GeneralDistributedMultivariatePolynomial	
	GeneralSparseTable	
	GroebnerFactorizationPackage	
9.37	GroebnerPackage	407
9.38	Heap	408
9.39	HexadecimalExpansion	409
9.40	Homogeneous Distributed Multivariate Polynomial	410
9.41	Integer	412
	9.41.1 Basic Functions	412
	9.41.2 Primes and Factorization	416
	9.41.3 Some Number Theoretic Functions	417
9.42	IntegerLinearDependence	419
		420
		424
		427
	LexTriangularPackage	429

9.47	LazardSetSolvingPackage	453
9.48	Library	462
9.49	LieExponentials	463
9.50	LiePolynomial	465
9.51	Linear Ordinary Differential Operator	468
	9.51.1 Differential Operators with Series Coefficients	468
9.52	LinearOrdinaryDifferentialOperator1	471
	9.52.1 Differential Operators with Rational Function Coefficients	472
9.53	LinearOrdinaryDifferentialOperator2	
	9.53.1 Differential Operators with Constant Coefficients	
	9.53.2 Differential Operators with Matrix Coefficients Operating on Vectors	
9.54	List	
	9.54.1 Creating Lists	
	9.54.2 Accessing List Elements	
	9.54.3 Changing List Elements	
	9.54.4 Other Functions	
	9.54.5 Dot, Dot	
9.55	LyndonWord	
	Magma	
9.57	MakeFunction	489
	MappingPackage1	
	Matrix	
	9.59.1 Creating Matrices	495
	9.59.2 Operations on Matrices	499
9.60	Multiset	502
9.61	MultivariatePolynomial	504
9.62	None	506
9.63	NottinghamGroup	506
9.64	Octonion	507
9.65	OneDimensionalArray	509
9.66	Operator	510
9.67	OrderedVariableList	513
9.68	Orderly Differential Polynomial	514
9.69	PartialFraction	519
9.70	Permanent	522
9.71	Permutation	522
9.72	Polynomial	523
9.73	Quaternion	530
9.74	Queue	532
9.75	RadixExpansion	533
9.76	RealClosure	536
9.77	RealSolvePackage	545
9.78	RegularTriangularSet	547
	RomanNumeral	559
9.80	Segment	561
	SegmentBinding	562

$9.82 \mathrm{Set}$		563
$9.83 \mathrm{Sin}$	gleInteger	566
9.84 Spa	arseTable	568
$9.85 \mathrm{Squ}$	uareMatrix	569
$9.86 \mathrm{Squ}$	uareFreeRegularTriangularSet	570
9.87 Sta	ck	574
$9.88 \mathrm{Str}$	eam	576
9.89 Str	ing	578
9.90 Str	ingTable	582
9.91 Syr	$oxnotembol{ ext{nbol}}$	583
9.92 Tal	ble	586
9.93 Tex	ctFile	588
$9.94 \mathrm{Tw}$	oDimensionalArray	590
$9.95 \mathrm{Tw}$	oDimensionalViewport	593
$9.96~\mathrm{Un}$	aryRecursiveAggregate	600
	ivariatePolynomial	
	ivariateSkewPolynomial	
	8.1 A second example	
9.98	8.2 A third example	615
	8.3 A fourth example	
	iversalSegment	
	etor	
9.101Voi	d	619
	WenTsunTriangularSet	
9.103XP	BWPolynomial	623
	olynomial	
	olynomialRing	
	roDimensionalSolvePackage	
10 Interact	tive Programming	359
	awing Ribbons Interactively	
	Ribbon Program	
	loring and Positioning Ribbons	
	nts, Lines, and Curves	
	Bouquet of Arrows	
	version: When Things Go Wrong	
	awing Complex Vector Fields	
	awing Complex Functions	
	actions Producing Functions	
		673
11 Package		677
		677
	·	679
		679
	V I	
11.4 Ca]	psules	680

	11.5 Input Files vs. Packages	681
	11.6 Compiling Packages	681
	11.7 Parameters	682
	11.8 Conditionals	684
	11.9 Testing	685
	11.10How Packages Work	686
		000
12	o a constant of the constant o	689
	12.1 Definitions	
	12.2 Exports	
	12.3 Documentation	
	12.4 Hierarchies	
	12.5 Membership	
	12.6 Defaults	
	12.7 Axioms	
	12.8 Correctness	
	12.9 Attributes	
	12.10Parameters	
	12.11Conditionals	
	12.12Anonymous Categories	097
13	Domains	699
	13.1 Domains vs. Packages	
	13.2 Definitions	
	13.3 Category Assertions	
	13.4 A Demo	
	13.5 Browse	
	13.6 Representation	
	13.7 Multiple Representations	
	13.8 Add Domain	
	13.9 Defaults	704
	13.10Origins	705
	13.11Short Forms	705
	13.12Example 1: Clifford Algebra	706
	13.13Example 2: Building A Query Facility	707
	13.13.1 A Little Query Language	
	13.13.2 The Database Constructor	709
		710
		711
		711
	13.13.6 Creating a Database	712
	13.13.7 Putting It All Together	
	13.13.8 Example Queries	713

	Browse	715
	4.1 The Front Page: Searching the Library	. 715
	14.2 The Constructor Page	. 717
	14.2.1 Constructor Page Buttons	. 720
	14.2.2 Cross Reference	. 722
	14.2.3 Views Of Constructors	. 724
	14.2.4 Giving Parameters to Constructors	
	4.3 Miscellaneous Features of Browse	
	14.3.1 The Description Page for Operations	
	14.3.2 Views of Operations	
	14.3.3 Capitalization Convention	
	11.9.9 Cupitumzution Convention	. 100
15	What's New in Axiom Version 2.0	731
	5.1 Important Things to Read First	. 731
	5.2 The NAG Library Link	
	15.2.1 Interpreting NAG Documentation	
	15.2.2 Using the Link	
	15.2.3 Providing values for Argument Subprograms	
	15.2.4 General Fortran-generation utilities in Axiom	
	15.2.5 Some technical information	
	15.2.3 Interactive Front-end and Language	
	15.4 Library	
	15.4 Library	
	15.6 Documentation	
	19.0 Documentation	
		. 144
Α	Axiom System Commands	747
\mathbf{A}	Axiom System Commands	747
A	A.1 Introduction	747 . 747
A	$\begin{array}{llllllllllllllllllllllllllllllllllll$	747 . 747 . 748
A	A.1 Introduction	747 . 747 . 748 . 749
A	A.1 Introduction	747 . 747 . 748 . 749 . 750
A	A.1 Introduction	747 . 747 . 748 . 749 . 750
A	A.1 Introduction	747 . 747 . 748 . 749 . 750 . 751
A	A.1 Introduction	747 . 747 . 748 . 749 . 750 . 751 . 752
A	A.1 Introduction	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754
A	A.1 Introduction	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe	747 748 749 750 751 752 754 754
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754 . 754 . 755
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754 . 754 . 755 . 756
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit A.13)fin	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754 . 755 . 756 . 756
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit A.13)fin A.14)frame	747 . 748 . 749 . 750 . 751 . 752 . 754 . 755 . 756 . 756 . 757
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit A.13)fin A.14)frame A.15)help	747 . 748 . 749 . 750 . 750 . 751 . 752 . 754 . 754 . 755 . 756 . 757
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit A.13)fin A.14)frame A.15)help A.16)history	747 748 749 750 750 751 752 754 754 755 756 756 757 758
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit A.13)fin A.14)frame A.15)help A.16)history A.17)include	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754 . 755 . 756 . 756 . 757 . 758 . 759 . 761
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit A.13)fin A.14)frame A.15)help A.16)history A.17)include A.18)library	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754 . 755 . 756 . 756 . 757 . 758 . 759 . 761 . 761
A	A.1 Introduction A.2)abbreviation A.3)browse A.4)cd A.5)clear A.6)close A.7)compile A.8)copyright A.9)credits A.10)describe A.11)display A.12)edit A.13)fin A.14)frame A.15)help A.16)history A.17)include	747 . 747 . 748 . 749 . 750 . 751 . 752 . 754 . 755 . 756 . 756 . 757 . 758 . 759 . 761 . 762

CONTENTS	15	

	F.14 scherk.input Glossary BackMatter Quotes
\mathbf{G}	
	r.14 Scherk.mput
	H. I./I. deports input
	F.13 antoine.input
	F.12 tetra.input
	F.11 dhtri.input
	F.10 ntube.input
	F.9 tknot.input
	F.8 conformal.input
	F.7 images8.input
	F.6 images7.input
	F.5 images6.input
	F.4 images5.input
	F.3 images3.input
	F.2 images2.input
	F.1 images1.input
\mathbf{F}	Programs for Axiom Images
\mathbf{E}	Operations
D	Packages
	Domains
	Categories
D	
	A.36)what
	A.35)undo
	A.34)trace
	A.33)trace
	A.31)system
	A.30)synonym
	A.29)summary
	A.28)spool
	A.27)show
	A.26)set
	A.25)savesystem
	A.24)regress
	A.23) read
	A.22)quit

16	CONTENTS
Bibliography	983
Index	985

Volume 1: Axiom Tutorial

1	Axi	om Fea	atures	1
	1.1	Introd	uction to Axiom	1
		1.1.1	Symbolic Computation	1
		1.1.2	Numeric Computation	2
		1.1.3	Mathematical Structures	2
		1.1.4	HyperDoc	3
		1.1.5	Interactive Programming	3
		1.1.6	Graphics	5
		1.1.7	Data Structures	5
		1.1.8	Pattern Matching	7
		1.1.9	Polymorphic Algorithms	8
			Extensibility	9
		1.1.11	v	9
			1	
2	Ten			11
			Types are Defined by Abstract Datatype Programs	11
			The Type of Basic Objects is a Domain or Subdomain	12
			Domains Have Types Called Categories	12
			Operations Can Refer To Abstract Types	13
			Categories Form Hierarchies	13
			Domains Belong to Categories by Assertion	13
			Packages Are Clusters of Polymorphic Operations	14
			The Interpreter Builds Domains Dynamically	14
			Axiom Code is Compiled	15
		2.0.21	Axiom is Extensible	15
3	Stor	rting A	viom	17
J	3.1		ng Up and Winding Down	17
	5.1	3.1.1	Clef	18
		3.1.1	Typographic Conventions	18
	3.2		xiom Language	19
	3.4	3.2.1	Arithmetic Expressions	19
		3.2.1 $3.2.2$	Previous Results	19
		3.2.2	Some Types	20
		3.2.3 $3.2.4$	Symbols, Variables, Assignments, and Declarations	21
		3.2.4 $3.2.5$	Conversion	23
		3.2.6		23
		3.2.0 $3.2.7$	Calling Functions	24
		3.2.8	Long Lines	24
	9.9	3.2.9	Comments	25
	3.3		Axiom as a Pocket Calculator	25
		3.3.1	Basic Arithmetic	25
		~ ~ ~ ツ	LVDOLONVORSION	- 1h

		3.3.3	Useful Functions
	3.4	Using	Axiom as a Symbolic Calculator
		3.4.1	Expressions Involving Symbols
		3.4.2	Complex Numbers
		3.4.3	Number Representations
		3.4.4	Modular Arithmetic
	3.5	Genera	al Points about Axiom
		3.5.1	Computation Without Output
		3.5.2	Accessing Earlier Results
		3.5.3	Splitting Expressions Over Several Lines
		3.5.4	Comments and Descriptions
		3.5.5	Control of Result Types
		3.5.6	Using system commands
		3.5.7	Using undo
	3.6	Data S	Structures in Axiom
		3.6.1	Lists
		3.6.2	Segmented Lists
		3.6.3	Streams
		3.6.4	Arrays, Vectors, Strings, and Bits
		3.6.5	Flexible Arrays
	3.7		ons, Choices, and Loops
		3.7.1	Reading Code from a File
		3.7.2	Blocks
		3.7.3	Functions
		3.7.4	Choices
		3.7.5	Loops
	3.8	Numb	ers
	3.9		Structures
	3.10		ding to Higher Dimensions
	3.11	Writin	g Your Own Functions
	3.12	Polyno	omials
			tives
			ation
		_	ential Equations
			on of Equations
4	Cma	nhias	0.5
4	Gra	phics	95 Plotting 2D graphs
		4.0.1 $4.0.2$	
		4.0.3	Two-Dimensional Control-Panel
		4.0.4	
		4.0.5	· · · · · · · · · · · · · · · · · · ·
		4.0.6	Appending a Graph to a Viewport Window Containing a Graph 112
		4.0.7	Plotting 3D Graphs

		4.0.8 Three-Dimensional Options	15
		4.0.9 Three-Dimensional Control-Panel	16
		4.0.10 Operations for Three-Dimensional Graphics	
		4.0.11 Customization using .Xdefaults	
5	Usir	g Types and Modes	
	5.1	The Basic Idea	25
		5.1.1 Domain Constructors	26
	5.2	Writing Types and Modes	31
		5.2.1 Types with No Arguments	31
		5.2.2 Types with One Argument	32
		5.2.3 Types with More Than One Argument	33
		5.2.4 Modes	33
		5.2.5 Abbreviations	33
	5.3	Declarations	34
	5.4	Records	36
	5.5	Unions	39
		5.5.1 Unions Without Selectors	39
		5.5.2 Unions With Selectors	
	5.6	The "Any" Domain	
	5.7	Conversion	
	5.8	Subdomains Again	
	5.9	Package Calling and Target Types	
		Resolving Types	
		Exposing Domains and Packages	
		Commands for Snooping	
	J.12		
6	Usir	g HyperDoc 18	59
	6.1	Headings	60
	6.2	Key Definitions	60
	6.3	Scroll Bars	60
	6.4	Input Areas	61
	6.5	Radio Buttons and Toggles	
	6.6	Search Strings	
		6.6.1 Logical Searches	
	6.7	Example Pages	
	6.8	X Window Resources for HyperDoc	
	0.0	12 Hillach 1000001000 101 11, poile oct the transfer of the tr	
7	Inpu	t Files and Output Styles 16	35
	7.1^{-2}		65
	7.2	The .axiom.input File	
	7.3	Common Features of Using Output Formats	
	7.4	Monospace Two-Dimensional Mathematical Format	
	7.5	TeX Format	
	7.6	IBM Script Formula Format	
	7.7	FORTRAN Format	

8	Axio	om System Commands	173
	8.1	Introduction	173
	8.2)abbreviation	174
	8.3)boot	175
	8.4	ocd	176
	8.5)close	176
	8.6)clear	177
	8.7)compile	178
	8.8	display	179
	8.9)edit	181
	8.10	Ífin	181
	8.11)frame	181
	8.12)hd	183
	8.13)help	183
	8.14)history	184
	8.15)library	186
	8.16)lisp	186
	8.17)ltrace	187
	8.18)pquit	187
	8.19)quit	187
	8.20)read	188
	8.21	Śset	188
	8.22	show	189
	8.23	spool	190
	8.24)synonym	190
	8.25)system	191
	8.26)trace	192
	8.27)undo	195
	8.28)what	196
	8.29	Makefile	197
Bi	bliog	raphy	199
In	dex		201

Volume 2: Axiom Users Guide

1	The	e Axiom System by James H. Davenport	1
	1.1	A little history	1
	1.2	Axiom's philosophy	2
	1.3	Axiom's typing scheme	4
		1.3.1 Aren't all these types confusing?	6
	1.4	Some AXIOM facilities	8
		1.4.1 How does one keep track of all this?	11
	1.5	Categories	13
		1.5.1 Using the)display command	19
2	Hov	w does one program in the Axiom system by James H. Davenport	23
	2.1	Introduction	23
	2.2	Programming concepts	24
	2.3	A first problem – Weighted Polynomials	27
		2.3.1 The problem definition	27
		2.3.2 The problem specification	29
		2.3.3 The problem implementation	32
		2.3.4 The PolynomialRing implementation	33
		2.3.5 Miscellaneous definitions	35
	2.4	A second problem – FourierSeries	36
		2.4.1 The problem definition	36
		2.4.2 The problem specification	36
		2.4.3 The FourierComponent implementation	37
		2.4.4 The FourierSeries implementation	38
3	Axi	om and Category Theory	41
	3.1	Covariance and Contravariance	41
	3.2	Axiom Type Lattice	42
	3.3	Terms to Understand	42
	3.4	Category Definition	43
	3.5	Monoids and Groups	44
4	Axi	om Implementation Details	45
-	4.1	Makefile	45
_	XX 7	4: C	4.77
5	vvr 1 5.1	ting Spad Code The Description: label and the)describe command	47 47
_		·	
6	Wri	ting test cases	51
A	The	e Principles of Axiom	53
В	The	e Axiom Conventions	55

22			CONTENTS

\mathbf{C}	Exa	mple Code	57
	C.1	domain WP WeightedPolynomials	57
	C.2	domain OWP OrdinaryWeightedPolynomials	59
	C.3	domain WP2 WeightedPolynomials2	60
	C.4	domain FCOMP FourierComponent	63
	C.5	domain FSERIES FourierSeries	64
D	The	Makefile	67
Bi	bliog	raphy	69
In	\mathbf{dex}		7 5

CONTENTS	23

volume of Axiom i rogrammers dure	Volume	3:	Axiom	Programmers	Guide
-----------------------------------	--------	----	-------	-------------	-------

1	A Language for Computational Algebra 1.1 Introduction	•
	1.2 Concepts	
2	Details for Programmers 2.1 Examining Internals	11 11
	2.2 Makefile	
Bi	ibliography	1.5

Volume 4:	Axiom	Developers	Guide

0.1	Tedious Maintainer Tasks	1
	0.1.1 Maintaining the credits list	1
0.2	What is the purpose of the HACKPI domain?	1
0.3	How Axiom Builds	1
	0.3.1 The environment variables	1
0.4	The runtime structure of Axiom	3
	0.4.1 The build step	3
	0.4.2 Where each output file is created	7
0.5		13
0.0		13
		18
	1 0	18
		21
	1 0 / 1	
	1 0 / 1	23
	1 0 / 1	25
	1 0 / 1	27
		28
		31
0.6		34
	0.6.1 svn	34
	0.6.2 git	34
	0.6.3 cvs	34
0.7	Common Lisps	37
	0.7.1 GCL	37
	0.7.2 CCL	38
		39
		39
	•	39
		39
		39
	•	39
	,	
0.0	•	39
0.8	9 9	39
0.9	8 8	42
	1	42
		42
0.10		43
	0.10.1 libcheck	43
	0.10.2 asq	44
0.11	Axiom internal representations	44
0.12	Spad to internal function calling	46
	-	46
0.13	<u> </u>	55
		55

CONTENTS	25
CONTENTS	2

	0.14.1 help documentation for algebra	55
	0.14.2 Adding help documentation in Makefile	55
	0.14.3 Using help documentation for regression testing	56
	0.14.4 help documentation as algebra test files	57
0.15	${\it debugsys} \ldots \ldots$	57
	0.15.1 debugging hyperdoc	57
0.16	Understanding a compiled function	57
0.17	The axiom.input startup file	65
0.18	Where are Axiom symbols stored?	65
0.19	Translating individual boot files to common lisp	67
0.20	Directories	68
	0.20.1 The mnt/linux/bin directory	69
	0.20.2 The mnt/linux/doc directory	70
	0.20.3 The mnt/linux/algebra directory	73
	0.20.4 The mnt/linux/etc directory	73
	0.20.5 The mnt/linux/lib directory	75
0.21	The)set command	75
	Special Output Formats	76
0.23	Hand creating the hyperdoc binary	76
	Low Level Debugging Techniques	77
	0.24.1 Finding Anonymous Function Signatures	77
	0.24.2 The example bug	81
	0.24.3 Operating system level I/O trace (strace)	96
0.25	How to make graphs in algebra books	97
0.26	Adding or Editing pages in Hyperdoc	98
0.27	Graphviz file creation	98
0.28	Adding Algebra	100
	0.28.1 Adding algebra to the books	100
	0.28.2 Creating a stand-alone pamphlet file	110
0.29	Makefile	
Bibliog	raphy	111

Volume 5: Axiom Interpreter

1	Typ	e Inference and Coercion 1
	1.1	Introduction
	1.2	Overview of the Abstract Datatype System
		1.2.1 Categories
		1.2.2 Domains
		1.2.3 Packages
		1.2.4 Modemaps
		1.2.5 Interpretation
		1.2.6 Modemap Selection
		1.2.7 Ambiguity
		1.2.8 Modes
	1.3	The Coerce Facility
		1.3.1 Coerce by Function
		1.3.2 Coerce by Mapping
		1.3.3 Coerce by Internal System Code
		1.3.4 Coercion of Algebraic Constants
		1.3.5 Retraction
		1.3.6 Coercion Query
	1.4	The Resolve Facility
		1.4.1 Resolve by Coercion Query
		1.4.2 Resolve by Rules
		1.4.3 Resolve by Type Destructuring
	1.5	An Example
	1.6	Acknowledgement
2	The	Interpreter 13
3	The	Fundamental Data Structures 15
		3.0.1 defvar \$PatternVariableList
		3.0.2 defvar \$FormalMapVariableList
	3.1	Frames and the Interpreter Frame Ring
	3.2)frame Command
		3.2.1 frame man page
	3.3	Data Structures
	3.4	Frame Access Macros
		3.4.1 defmacro frameName
		3.4.2 defmacro frameInteractive
		3.4.3 defmacro frameIOIndex
		3.4.4 defmacro frameHiFiAccess
		3.4.5 defmacro frameHistList
		3.4.6 defmacro frameHistListLen
		3.4.7 defmacro frameHistListAct
		3.4.8 defmacro frameHistRecord

CONTENTS	27
----------	----

		3.4.9	defmacro frameHistoryTable
			defmacro frameExposureData
	3.5		ons to manipulate frames
		3.5.1	The top level frame command
		3.5.2	The top level frame command handler
		3.5.3	Initializing the Interpreter Frame Ring
		3.5.4	Create a new, empty Interpreter Frame
		3.5.5	Create a list of all of the frame names
		3.5.6	Display the frame name list message
		3.5.7	Collect the global variables into a Frame
		3.5.8	Update global variables from the Current Frame
		3.5.9	Replace the current frame and update from the globals
		3.5.10	Get Named Frame Environment (aka Interactive)
		3.5.11	Find a Frame in the Frame Ring by Name
		3.5.12	Change to the Named Interpreter Frame
		3.5.13	Move to the next Interpreter Frame in Ring
		3.5.14	Move to the previous Interpreter Frame in Ring
		3.5.15	Add a New Interpreter Frame
		3.5.16	Import items from another frame
			Close an Interpreter Frame $\dots \dots \dots$
	3.6	Global	variables associated with the frame
		3.6.1	defvar \$interpreterFrameRing
		3.6.2	defvar \$interpreterFrameName
		3.6.3	defvar \$InteractiveFrame
		3.6.4	defvar \$IOindex
	3.7	Interpr	reter Functions using Frames
4	The	Messa	age Mechanism 37
		4.0.1	defvar \$msgAlist
		4.0.2	defvar \$testingErrorPrefix
		4.0.3	defvar \$msgdbPrims
		4.0.4	defvar \$msgdbPunct
		4.0.5	defvar \$msgdbNoBlanksBeforeGroup
		4.0.6	defvar \$msgdbNoBlanksAfterGroup
		4.0.7	defun Say a message using a keyed lookup
		4.0.8	defun Handle msg formatting and print to file
		4.0.9	defun Break a message into words
		4.0.10	defun Write a msg into spadmsg. listing file $\ \ldots \ \ldots \ \ldots \ \ 40$
		4.0.11	defun sayMSG
5	The		ry Mechanism 41
		5.0.12	defvar \$HiFiAccess
		5.0.13	defvar \$HistList
			lem:lem:lem:lem:lem:lem:lem:lem:lem:lem:
			defvar \$HistListAct
		5.0.16	defvar $\frac{1}{2}$ sinternal History Table

		5.0.17	defvar \$HistRecord	42
		5.0.18	defvar \$historyFileType	42
6	The	undo	mechanism	45
	6.1	Data S	Structures	45
	6.2	Initial	Undo Variables	45
		6.2.1	defvar \$frameRecord	45
		6.2.2	defvar \$previousBindings	45
		6.2.3	defvar \$reportundo	46
	6.3	The un	ndo functions	46
		6.3.1	defun undo	46
		6.3.2	defun undoSteps	47
		6.3.3	defun undoSingleStep	48
		6.3.4	defun undoLocalModemapHack	49
		6.3.5	Remove undo lines from history write	50
		6.3.6	defun reportUndo	52
		6.3.7	Undo previous n commands	54
7	Trac	cing		55
	7.1		elp text	55
	7.2		race global variables	59
		7.2.1	defvar \$breakCondition	59
		7.2.2	defvar \$constructors	59
		7.2.3	defvar \$constructors	60
		7.2.4	defvar \$countList	60
		7.2.5	defvar \$depthAlist	60
		7.2.6	defvar \$domains	60
		7.2.7	defvar \$domainTraceNameAssoc	60
		7.2.8	defvar \$doNotAddEmptyModeIfTrue	60
		7.2.9	defvar \$embeddedFunctions	61
		7.2.10	defvar \$fromSpadTrace	61
		7.2.11	defvar \$lastUntraced	61
			defvar \$letAssoc	61
			defvar \$mapSubNameAlist	61
			defvar \$mathTrace	62
		7.2.15	defvar \$mathTraceList	62
		7.2.16	defvar \$monitorArgs	62
		7.2.17	defvar \$monitorCaller	62
			defvar \$monitorDepth	62
		7.2.19	defvar \$monitorFunDepth	62
		7.2.20		63
			defvar \$monitorPretty	63
			defvar \$monitorValue	63
			defvar \$optionAlist	63
			defvar \$options	63
		7.2.25	defvar \$OutputForm	64

	7.2.26	defvar \$packages	64
	7.2.27	defvar \$QuickLet	64
	7.2.28	defvar \$reportSpadtrace	64
			64
			64
	7.2.31	defvar \$timerList	65
	7.2.32	defvar \$tracedMapSignatures	65
	7.2.33	defvar \$traceDomains	65
	7.2.34	defvar \$traceErrorStack	65
	7.2.35	defvar \$TraceFlag	65
	7.2.36	defvar \$traceletflag	66
			66
	7.2.38	defvar \$traceNames	66
	7.2.39	defvar \$traceNoisely	66
	7.2.40	defvar \$traceOptionList	66
			67
	7.2.42		67
			67
7.3			67
7.4			67
	7.4.1		67
	7.4.2	· /	68
	7.4.3		68
	7.4.4		68
	7.4.5		72
	7.4.6	defun trace3	72
	7.4.7	defun embededFunction	77
	7.4.8		77
	7.4.9		77
	7.4.10		78
			78
			78
			80
	7.4.14	defun monitorEvalAfter	81
			81
			81
			81
		*	82
	7.4.19	defun traceReply	82
		- *	84
		, -	85
		- v	85
			85
		-	85
			86
		•	86

7.4.27	defun prounters	 	 	 . 87
7.4.28	defun transOnlyOption	 	 	. 87
7.4.29	defun stackTraceOptionError	 	 	. 88
7.4.30	defun removeOption	 	 	. 88
	defun domainToGenvar			
7.4.32	defun subTypes	 	 	. 89
	defun isListOfIdentifiers			
7.4.34	defun isListOfIdentifiersOrStrings	 	 	. 90
7.4.35	defun getPreviousMapSubNames	 	 	. 90
7.4.36	defun lassocSub	 	 	. 91
7.4.37	defun rassocSub	 	 	. 91
7.4.38	defun isUncompiledMap	 	 	. 91
	defun isInterpOnlyMap			
7.4.40	defun isSubForRedundantMapName	 	 	. 92
7.4.41	defun untraceMapSubNames	 	 	. 92
7.4.42	defun funfind,LAM	 	 	. 93
7.4.43	defmacro funfind	 	 	. 93
	defun isDomainOrPackage			
	defun flattenOperationAlist			
	defun letPrint			
7.4.47	defun Identifier beginning with a sharpsign-number? .	 	 	. 96
	defun Identifier beginning with a sharpsign?			
7.4.49	defun letPrint2	 	 	. 96
7.4.50	defun letPrint3	 	 	. 98
7.4.51	defun hasPair	 	 	. 99
7.4.52	defun shortenForPrinting	 	 	. 99
	defun getOption			
	defun orderBySlotNumber			
	defun spadReply			
7.4.56	defun remover	 	 	. 101
7.4.57	defun stupidIsSpadFunction	 	 	. 101
7.4.58	defun compileBoot	 	 	. 101
7.4.59	defun getTraceOptions	 	 	. 102
7.4.60	defun saveMapSig	 	 	. 102
7.4.61				
7.4.62	defun getTraceOption,hn			
	defun getTraceOption			
7.4.64	defun traceOptionError	 	 	. 107
	defun genDomainTraceName			
7.4.66	defun untrace	 	 	. 108
7.4.67	defun /untrace-0	 	 	. 108
7.4.68	defun /untrace-1	 	 	. 109
	defun /untrace-reduce			
	defun /untrace-2			
	defun isGenvar			
7.4.72	defun transTraceItem	 	 	. 111

7.4.73 defun removeTracedMapSigs	12
7.4.74 defun coerce TraceArgs2E	
7.4.75 defun coerceSpadArgs2E	13
7.4.76 defun coerceTraceFunValue2E	14
7.4.77 defun coerceSpadFunValue2E	15
7.4.78 defun getMapSubNames	15
7.4.79 defun spadTrace,g	16
7.4.80 defun spadTrace,isTraceable	16
7.4.81 defun spadTrace	16
7.4.82 defun getOperationAlistFromLisplib	19
7.4.83 defun markUnique	19
7.4.84 defun bpitrace	20
7.4.85 defun traceDomainLocalOps	20
7.4.86 defun untraceDomainLocalOps	20
7.4.87 defun traceDomainConstructor	20
7.4.88 defun untraceDomainConstructor,keepTraced?	22
7.4.89 defun untraceDomainConstructor	22
7.4.90 defun mapLetPrint	23
7.4.91 defun getAliasIfTracedMapParameter	23
7.4.92 defun getBpiNameIfTracedMap	24
7.4.93 defun spadTraceAlias	
7.4.94 defun reportSpadTrace	25
7.4.95 defun /tracereply	25
7.4.96 defun spadUntrace	26
7.4.97 defun prTraceNames,fn	28
7.4.98 defun prTraceNames	28
7.4.99 defun addTraceItem	29
7.4.100 defun ?t	29
7.4.101 defun Handle traced function entry	30
7.4.102 defun Print the arguments to a traced function	31
7.4.103 defun monitorPrintArg	32
7.4.104 defun monitorPrint	32
7.4.105 defun monitorPrintRest	33
7.4.106 defun prinmathor0	33
7.4.107 defun Handle traced function exit	33
7.4.108 defun monitorPrintValue	34
7.4.109 defun limitedPrint1	35
$7.4.110\mathrm{defun\ smallEnough}\ \dots\ \dots\ \dots\ \dots\ 13$	35
7.4.111 defun How big is an object?	35
7.4.112 defun tracelet	36
7.4.113 defun breaklet	36
7.4.114 defun break	37

8	\mathbf{Exp}		groups 13	
	8.1	Functi	ons to manipulate exposure	9
		8.1.1	Expose a group	9
		8.1.2	The top level set expose command handler	0
		8.1.3	The top level set expose add command handler	1
		8.1.4	The top level set expose add constructor handler	2
		8.1.5	The top level set expose drop handler	3
		8.1.6	The top level set expose drop group handler	
		8.1.7	The top level set expose drop constructor handler	
		8.1.8	Display exposed groups	
		8.1.9	Display exposed constructors	
		8.1.10	Display hidden constructors	
	8.2		ure Data Structures	
		8.2.1	defvar \$localExposureData	
		8.2.2	defvar \$localExposureDataDefault	
		8.2.3	defvar \$globalExposureGroupAlist	
		0.2.0	48105001211postato di outpitato	_
9	The	global	l variables 17	_
		9.0.4	Credits	3
		9.0.5	defvar creditlist	3
		9.0.6	defvar \$current-directory	5
		9.0.7	defvar \$directory-list	6
		9.0.8	defvar \$InitialModemapFrame	6
		9.0.9	defvar \$library-directory-list	6
		9.0.10	defvar \$msgDatabaseName	7
			defvar \$openServerIfTrue	
			defvar \$relative-directory-list	
			defvar \$relative-library-directory-list	
			defvar \$spadroot	
			defvar \$SpadServer	
			defvar \$SpadServerName	
10		rting A		
			rerview of a Simple Input	
	10.2		g the input	
		10.2.1	Creating a Delay – incString	5
		10.2.2	Creating a Delay – next	6
		10.2.3	Creating a Delay – ncloopParse	7
		10.2.4	Evaluating a Delay – intloopProcess	7
		_		_
11		om De		
			les Used	
			Structures	
	11.3		ons	
			Set the restart hook	
		$11\ 3\ 2$	restart function (The restart function) 27	6

11.3.3 defvar localVars	78
11.3.4 defun Non-interactive restarts	78
11.3.5 defun The startup banner messages	79
11.3.6 defun Make a vector of filler characters	79
11.3.7 defvar \$PrintCompilerMessageIfTrue	80
11.3.8 Starts the interpreter but do not read in profiles	80
11.3.11 defun Reset the stack limits	81
0 1	
12.1.2 defvar curoutstream	83
12.1.3 defvar errorinstream	83
12.1.4 defvar erroroutstream	84
12.1.5 defvar *eof*	84
12.1.6 defvar *whitespace*	84
12.1.7 defvar \$InteractiveMode	84
12.1.8 defvar \$env	84
12.1.9 defvar \$e	85
12.1.10 defvar \$boot	85
12.1.11 \$newspad	85
12.1.12 defvar \$newspad	85
12.1.13 Top-level read-parse-eval-print loop	85
12.1.16 defvar \$intRestart	87
•	
•	
•	
•	
	91
	-
- · ·	
- v	
v v	
12.3.9 defun init-memory-config	
	11.3.4 defun Non-interactive restarts 2 11.3.5 defun Make a vector of filler characters 2 11.3.6 defun Make a vector of filler characters 2 21.3.7 defvar \$PrintCompilerMessagelfTrue 2 21.3.8 Starts the interpreter but do not read in profiles 2 21.3.9 defvar \$quitTag 2 11.3.10 defun runspad 2 11.3.11 defun Reset the stack limits 2 32 11.3.11 defun Reset the stack limits 40 2 40 2 41.1.1 defvar curinstream 2 12.1.2 defvar curoutstream 2 12.1.3 defvar erroroutstream 2 12.1.4 defvar erroroutstream 2 12.1.5 defvar **whitespace* 2 12.1.6 defvar *whitespace* 2 12.1.9 defvar \$se 2 12.1.1 defvar \$InteractiveMode 2 12.1.2 defvar \$se 2 12.1.1 defvar \$se 2 12.1.10 defvar \$se 2 12.1.12 defvar \$sewspad 2 12.1.12 defvar \$sewspad 2 12.1.13 defvar \$intRestart 2 12.1.15 defvar \$intRestart

12.3.10 Set spadroot to be the AXIOM shell variable	
12.3.11 Does the string start with this prefix?	295
12.3.12 defun Interpret a line of lisp code	296
12.3.13 Get the current directory	
12.3.14 Prepend the absolute path to a filename	
12.3.15 Make the initial modemap frame	
12.3.16 defun ncloopEscaped	
12.3.17 defun intloopProcessString	. 297
12.3.18 defun ncloopParse	. 297
12.3.19 defun next	298
12.3.20 defun next1	298
12.3.21 defun incString	
12.3.22 Call the garbage collector	
12.3.23 defun reroot	299
12.3.24 defvar \$current-directory	. 301
12.3.25 defun setCurrentLine	301
12.3.26 Show the Axiom prompt	301
12.3.27 defvar \$frameAlist	302
12.3.28 defvar \$frameNumber	302
12.3.29 defvar \$currentFrameNum	302
12.3.30 defvar \$EndServerSession	302
12.3.31 defvar \$NeedToSignalSessionManager	303
12.3.32 defvar \$sockBufferLength	303
12.3.33 READ-LINE in an Axiom server system	
12.3.34 defun protectedEVAL	
12.3.35 defvar \$QuietCommand	
12.3.36 defun executeQuietCommand	
12.3.37 defun parseAndInterpret	
12.3.38 defun parseFromString	
12.3.39 defvar \$interpOnly	
12.3.40 defvar \$minivectorNames	
12.3.41 defvar \$domPvar	
12.3.42 defvar \$compilingMap	
12.3.43 defvar \$instantRecord	
12.3.44 defun processInteractive	
12.3.45 defvar \$ProcessInteractiveValue	
12.3.46 defvar \$HTCompanionWindowID	
12.3.47 defun processInteractive1	
12.3.48 defun interpret TopLevel	
12.3.49 defvar \$genValue	
12.3.50 defun Type analyzes and evaluates expression x, returns object	
12.3.51 defun Dispatcher for the type analysis routines	
12.3.52 defvar \$ThrowAwayMode	
12.3.53 defun interpret2	
12.3.54 defvar \$\text{\$\text{\$runTestFlag}\$} \tag{12.3.54 defvar \$\text{\$\text{\$runTestFlag}\$}} \tag{12.3.54 defvar \$\text{\$\text{\$runTestFlag}\$}} \tag{12.3.54 defvar \$\text{\$\text{\$\text{\$runTestFlag}\$}} \tag{12.3.54 defvar \$\text{\$\text{\$\text{\$\text{\$runTestFlag}\$}}} 12.3.54 defvar \$\text{\$\tex	
12.3.55 defvar \$mkTestFlag	
12.0.00 dotvar with 10001 lag	014

12.3.56 defun Result Output Printing	315
12.3.57 defun printStatisticsSummary	316
12.3.58 defun printStorage	316
$12.3.59 defun\ printTypeAndTime \dots \dots$	
12.3.60 defun printAsTeX	318
12.3.61 defun same UnionBranch	318
12.3.62 defun msgText	319
12.3.63 defun Right-justify the Type output	319
12.3.64 defun Destructively fix quotes in strings	319
12.3.65 Include a file into the stream	320
12.3.66 defun intloopInclude0	320
12.3.67 defun intloopProcess	320
12.3.68 defun intloopSpadProcess	
12.3.69 defun intloopSpadProcess,interp	
12.3.70 defun phParse	
12.3.71 defun phIntReportMsgs	
12.3.72 defun phInterpret	
12.3.73 defun intInterpretPform	
12.3.74 defun zeroOneTran	
12.3.75 defun ncConversationPhase	
12.3.76 defun ncConversationPhase,wrapup	
12.3.77 defun ncError	
12.3.78 defun intloopEchoParse	
12.3.79 defun ncloopPrintLines	
12.3.80 defun mkLineList	
12.3.81 defun nonBlank	
12.3.82 defun ncloopDQlines	
12.3.83 defun poGlobalLinePosn	
12.3.84 defun streamChop	
12.3.85 defun ncloopInclude0	
12.3.86 defun incStream	
12.3.87 defun incRenumber	
12.3.88 defun incZip	
12.3.89 defun incZip1	
12.3.90 defun incIgen	
12.3.91 defun inclgen 1	
12.3.93 defun incRenumberLine	331 331
8	331
	332
	332
	333
•	333
•	333
1	333
12.3.10 Hefvar Elseif Skip To End	333

12.3.10 2 lefvar ElseifKeepPart
12.3.103defvar ElseifSkipPart
12.3.104defvar ElseSkipToEnd
12.3.105defvar ElseKeepPart
12.3.10@defun Top?
12.3.107defun If?
12.3.10&lefun Elseif?
12.3.10 Mefun Else?
12.3.11@lefun SkipEnd?
12.3.11tlefun KeepPart?
12.3.112lefun SkipPart?
12.3.113defun Skipping?
12.3.114defun incLude1
12.3.115defun xlPrematureEOF
12.3.116defun xlMsg
12.3.117lefun xlOK
12.3.118lefun xlOK1
12.3.11 Mefun inc Append
12.3.12@lefun incAppend1
12.3.12tlefun incLine
12.3.122defun incLine1
12.3.123defun inclmsgPrematureEOF
12.3.124lefun theorigin
12.3.125defun porigin
12.3.126defun ifCond
12.3.127defun xlSkip
12.3.128lefun xlSay
12.3.129defun inclmsgSay
12.3.13@defun theid
12.3.13 tlefun xlNoSuchFile
12.3.132lefun inclmsgNoSuchFile
12.3.133defun thefname
12.3.134lefun pfname
12.3.135defun xlCannotRead
12.3.136defun inclmsgCannotRead
12.3.137defun xlFileCycle
12.3.138lefun inclmsgFileCycle
12.3.13 Mefun xlConActive
12.3.14@lefun inclmsgConActive
12.3.14 tlefun xlConStill
12.3.142lefun inclmsgConStill
12.3.143defun xlConsole
12.3.144lefun inclmsgConsole
12.3.145defun xlSkippingFin
12.3.146lefun inclmsgFinSkipped
12.3.147defun xlPrematureFin

13.0.172lefvar scanKeyWords 35 13.0.173lefvar infgeneric 36 13.0.174lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.176lefun scanToken 36 13.0.178lefun scanToken 36 13.0.180lefun lfid 36 13.0.181lefun scanComment 36 13.0.182lefun lfcomment 36 13.0.183lefun Is it a - comment? 36 13.0.185lefun scanNegComment 36 13.0.185lefun punctuation? 36 13.0.186lefun punctuation? 36 13.0.188lefun scanPunct 36 13.0.188lefun subMatch 36 13.0.190lefun scanKeyTr 37	1	3.14&lefun inclmsgPrematureFin	9
12.3.15Hefun inclmsglfSyntax 35 12.3.15Zefun xlIfBug 35 12.3.15Alefun inclmsglfBug 35 12.3.15Alefun xlCmdBug 35 12.3.15Alefun xlCmdBug 35 12.3.15Alefur incCommands 35 12.3.15Alefur incCommands 35 12.3.15Alefun incCommand? 35 12.3.15Alefun incCommand? 35 12.3.16Alefun incCommandTail 35 12.3.16Alefun incDrop 35 12.3.16Alefun incFname 35 12.3.16Alefun incNConsoles 35 12.3.16Alefun incRegen 36 12.3.16Alefun incRegen 36 13.0.17Alefun incReg	1	3.14 Mefun assert Cond	0
12.3.152efun xllfBug 35 12.3.153efun inclmsgIfBug 35 12.3.154efun xlCmdBug 35 12.3.156efvar incCommands 35 12.3.156efvar spfMacros 35 12.3.158efun incClassify 35 12.3.158efun incCommand? 35 12.3.168efun incCommand? 35 12.3.166lefun incCommandTail 35 12.3.162efun incDrop 35 12.3.163efun incFileInput 35 12.3.163efun incFileInput 35 12.3.163efun incConsoleInput 35 12.3.163efun incConsoleInput 35 12.3.163efun incRoctive? 35 12.3.168efun incRoctive? 35 12.3.169efun incRgen 35 12.3.179efvar StreamNil 35 12.3.179efvar StreamNil 35 13.0.172efvar scanKeyWords 35 13.0.173efvar infigeneric 36 13.0.173efvan scanToken 36 13.0.176efun scanInken 36 13.0.176efun scanComment 36 13.0.186efun Is it a ++ comment? 36 13.0.188efun scanComment 36 13.0.18]	3.15@lefun xlIfSyntax	0
12.3.152efun xllfBug 35 12.3.153efun inclmsgIfBug 35 12.3.154efun xlCmdBug 35 12.3.156efvar incCommands 35 12.3.156efvar spfMacros 35 12.3.158efun incClassify 35 12.3.158efun incCommand? 35 12.3.168efun incCommand? 35 12.3.166lefun incCommandTail 35 12.3.162efun incDrop 35 12.3.163efun incFileInput 35 12.3.163efun incFileInput 35 12.3.163efun incConsoleInput 35 12.3.163efun incConsoleInput 35 12.3.163efun incRoctive? 35 12.3.168efun incRoctive? 35 12.3.169efun incRgen 35 12.3.179efvar StreamNil 35 12.3.179efvar StreamNil 35 13.0.172efvar scanKeyWords 35 13.0.173efvar infigeneric 36 13.0.173efvan scanToken 36 13.0.176efun scanInken 36 13.0.176efun scanComment 36 13.0.186efun Is it a ++ comment? 36 13.0.188efun scanComment 36 13.0.18]	3.15tlefun inclmsgIfSyntax	0
12.3.153lefun inclmsgHBug 35 12.3.154lefun xlCmdBug 35 12.3.155lefun inclmsgCmdBug 35 12.3.156lefvar incCommands 35 12.3.156lefun incClassify 35 12.3.158lefun incCommand? 35 12.3.166lefun incCommand? 35 12.3.166lefun incDromandTail 35 12.3.163lefun incDrop 35 12.3.163lefun incFleInput 35 12.3.163lefun incRosoleInput 35 12.3.163lefun incNConsoles 35 12.3.163lefun incRosoles 35 12.3.163lefun incRegen 35 12.3.163lefun incRegen 35 12.3.163lefun incRegen 35 12.3.173lefun incRegen 35 12.3.174lefun incRegen 35 13.0.175lefun incRegen 35 13.0.176lefun scance 35 13.0.176lefun scance 36 13.0.176lefun scanlgnoreLine 36 13.0.176lefun scanlgnoreLine 36 13.0.176lefun scanloment 36 13.0.186lefun scanComment 36 13.0.188lefun scanComment 36 13.0.186			
12.3.154efun xlCmdBug 35 12.3.156efun incImsgCmdBug 35 12.3.156efvar incCommands 35 12.3.157efvar SpfMacros 35 12.3.158efun incClassify 35 12.3.168efun incPrefix? 35 12.3.166lefun incCommandTail 35 12.3.166lefun incIrop 35 12.3.163efun incIrname 35 12.3.163efun incFileInput 35 12.3.163efun incNconsoleInput 35 12.3.163efun incNconsoles 35 12.3.163efun incNconsoles 35 12.3.163efun Delay 35 12.3.17defvar StreamNil 35 12.3.17defvar StreamNil 35 13.0.17defvar scanKeyWords 35 13.0.17defvar infegencic 36 13.0.17defvan incotoks 36 13.0.17defvan incotoks 36 13.0.17defvan incotoken 36 13.0.17defvan incotoken 36 13.0.17defun incotoken 36 13.0.17defun scanIgnoreLine 36 13.0.18defun scanComment 36 13.0.18defun scanComment 36 13.0.18defun punctu			
12.3.15 5 fefun inclmsgCmdBug 35 12.3.15 6 fefvar incCommands 35 12.3.15 6 fefvar incCommanders 35 12.3.15 6 fefun incClassify 35 12.3.15 6 fefun incCommand? 35 12.3.16 6 fefun incCommandTail 35 12.3.16 6 fefun incDrop 35 12.3.16 6 fefun incFlieInput 35 12.3.16 6 fefun incConsoleInput 35 12.3.16 6 fefun incConsoleInput 35 12.3.16 6 fefun incActive? 35 12.3.16 6 fefun incRgen 35 12.3.16 6 fefun incRgen 35 12.3.17 fefun incRgen 35 12.3.17 fefun incRgen 35 12.3.17 fefun Delay 35 12.3.17 fefun incRgen1 35 13.0.17 fefun incRgen1 35 13.0.17 fefun incRgen1 35 13.0.17 fefun incoftoks 36 13.0.17 fefun incoftoks 36 13.0.17 fefun scanIgnoreLine 36 13.0.17 fefun scanIgnoreLine 36 13.0.18 fefun scanComment 36 13.0.18 fefun scanComment 36 13.0.18 fefun punctuation? 36 <			
12.3.15@efvar incCommands 35 12.3.15Wefun incClassify 35 12.3.15Wefun incCommand? 35 12.3.16Wefun incPrefix? 35 12.3.16Wefun incDrop 35 12.3.16Wefun incIropp 35 12.3.16Wefun incFileInput 35 12.3.16Wefun incConsoleInput 35 12.3.16Wefun incNConsoles 35 12.3.16Wefun incRen 35 12.3.16Wefun incRen 35 12.3.16Wefun incRen 35 12.3.16Wefun incRen 35 12.3.17Wefvar StreamNil 35 12.3.17Wefvar StreamNil 35 13.0.17Wefvar scanKeyWords 35 13.0.17Wefvar infgeneric 36 13.0.17Wefun lineoftoks 36 13.0.17Wefun scanIgnoreLine 36 13.0.17Wefun scanIgnoreLine 36 13.0.17Wefun lifd 36 13.0.18Wefun Is it a ++ comment? 36 13.0.18Wefun Is it a - comment 36 13.0.18Wefun Is it a - comment? 36 13.0.18Wefun Is it a - comment? 36 13.0.18Wefun scanPunct 36 13.0.18Wef			
12.3.15Tefvar \$pfMacros 35 12.3.15Mefun incClassify 35 12.3.16Mefun incCommand? 35 12.3.16Mefun incPrefix? 35 12.3.16Mefun incCommandTail 35 12.3.16Mefun incIPrame 35 12.3.16Mefun incFileInput 35 12.3.16Mefun incConsoleInput 35 12.3.16Mefun incNConsoles 35 12.3.16Mefun incRgen 35 12.3.16Mefun incRgen 35 12.3.16Mefun belay 35 12.3.17Mefvar StreamNil 35 12.3.17Mefvar scanKeyWords 35 13.0.17Mefvar infgeneric 36 13.0.17Mefun incextline 36 13.0.17Mefun scanToken 36 13.0.17Mefun scanToken 36 13.0.17Mefun scanToken 36 13.0.18Mefun scanComment 36 13.0.18Mefun Is it a + comment? 36 13.0.18Mefun scanPogComment 36 13.0.18Mefun scanPunct 36 13.0.18Mefun scanNegComment 36 13.0.18Mefun scanPunct 36 13.0.18Mefun subMatch 36 13.0.19Mefun scanKeyTr			
12.3.15%lefun incClassify 35 12.3.15%lefun incPrefix? 35 12.3.16Wefun incPrefix? 35 12.3.16Wefun incPrefix? 35 12.3.16Hefun incDrop 35 12.3.16Mefun incFleInput 35 12.3.16Mefun incConsoleInput 35 12.3.16Mefun incNconsoles 35 12.3.16Mefun incRegen 35 12.3.16Mefun incRegen 35 12.3.16Mefun Delay 35 12.3.17Mefvar StreamNil 35 12.3.17defvar StreamNil 35 12.3.17defvar scanKeyWords 35 13.0.17Zefvar scanKeyWords 35 13.0.17Zefvar infgeneric 36 13.0.17Zefun lineotfoks 36 13.0.17Mefun lineotfoks 36 13.0.17Mefun scanIporeLine 36 13.0.17Mefun scanFoken 36 13.0.18Mefun scanComment 36 13.0.18Mefun scanComment 36 13.0.18Mefun lis it a - comment? 36 13.0.18Mefun punctuation? 36 13.0.18Mefun scanPunct 36 13.0.18Mefun substringMatch 36 13.0.19Mefun sc			
12.3.15 Mefun incCommand? 35 12.3.16 Mefun incPrefix? 35 12.3.16 Hefun incCommandTail 35 12.3.16 Mefun incIFname 35 12.3.16 Mefun incFileInput 35 12.3.16 Mefun incNConsoleInput 35 12.3.16 Mefun incNConsoles 35 12.3.16 Mefun incRegen 35 12.3.16 Mefun Delay 35 12.3.17 Mefvar StreamNil 35 12.3.17 Hefun incRgen1 35 13.0.17 Mefvar ScanKeyWords 35 13.0.17 Mefun lineoftoks 36 13.0.17 Mefun lineoftoks 36 13.0.17 Mefun scanIgnoreLine 36 13.0.17 Mefun scanIgnoreLine 36 13.0.17 Mefun scanToken 36 13.0.18 Mefun scanToken 36 13.0.18 Mefun scanComment 36 13.0.18 Mefun scanComment 36 13.0.18 Mefun scanPunct 36 13.0.18 Mefun scanPunct 36 13.0.18 Mefun subMatch 36 13.0.18 Mefun subMatch 36 13.0.18 Mefun subMatch 36 13.0.19 Mefun scanKeyTr 37 <			
12.3.16@efun incPrefix? 35 12.3.16?lefun incCommandTail 35 12.3.16?lefun inclProp 35 12.3.16?lefun inclFname 35 12.3.16?lefun incPileInput 35 12.3.16?lefun incConsoleInput 35 12.3.16?lefun incActive? 35 12.3.16?lefun incRegen 35 12.3.16?lefun Delay 35 12.3.17?lefvar StreamNil 35 12.3.17!lefun incRgen1 35 13.0.17?lefvar scanKeyWords 35 13.0.17?lefun inceftoks 36 13.0.17?lefun inceftoks 36 13.0.17*lefun nextline 36 13.0.17*lefun scanIgnoreLine 36 13.0.17*lefun scanToken 36 13.0.17*lefun scanToken 36 13.0.18*lefun scanComment 36 13.0.18*lefun scanComment 36 13.0.18*lefun scanPegComment 36 13.0.18*lefun scanPegComment 36 13.0.18*lefun subMatch 36 13.0.18*lefun subMatch 36 13.0.19*lefun scanFingMatch 36 13.0.19*lefun scanKeyTr 37			
12.3.16Hefun incCommandTail 35 12.3.16Zefun incIPrame 35 12.3.16Alefun incIPrame 35 12.3.16Alefun incPileInput 35 12.3.16Alefun incConsoleInput 35 12.3.16Alefun incNConsoles 35 12.3.16Alefun incReen 35 12.3.16Alefun incReen 35 12.3.17Alefun Delay 35 12.3.17Alefun incReen1 35 13.0.17Alefun incReen1 35 13.0.17Alefun incReen1 35 13.0.17Alefun incReenic 36 13.0.17Alefun incoftoks 36 13.0.17Alefun incoftoks 36 13.0.17Alefun scanIgnoreLine 36 13.0.17Alefun constoken 36 13.0.17Alefun scanToken 36 13.0.17Befun scanToken 36 13.0.18Befun scanComment 36 13.0.18Befun Is it a ++ comment? 36 13.0.18Befun scanNegComment 36 13.0.18Befun punctuation? 36 13.0.18Befun scanPunct 36 13.0.18Befun subMatch 36 13.0.19Gefun scanKeyTr 37			
12.3.162lefun incDrop 35 12.3.163lefun incFlame 35 12.3.163lefun incPileInput 35 12.3.163lefun incNonsoles 35 12.3.163lefun incNonsoles 35 12.3.163lefun incRegen 35 12.3.163lefun incRegen 35 12.3.174lefun Delay 35 12.3.174lefun incRegen 35 12.3.174lefun incRegen 35 13.0.172lefvar StreamNil 35 12.3.174lefun incRegen 35 13.0.172lefvar scanKeyWords 35 13.0.172lefvar infegeneric 36 13.0.173lefun inextline 36 13.0.173lefun inextline 36 13.0.173lefun inextline 36 13.0.173lefun scanIgnoreLine 36 13.0.173lefun scanToken 36 13.0.173lefun scanToken 36 13.0.184lefun scanComment 36 13.0.184lefun scanNegComment 36 13.0.184lefun scanNegComment 36 13.0.184lefun scanPunct 36 13.0.184lefun substringMatch 36 13.0.184lefun scanKeyTr 37 13.0.			
12.3.163defun incFname 35 12.3.164defun incFileInput 35 12.3.165defun incConsoleInput 35 12.3.166defun incNConsoles 35 12.3.165defun incRogen 35 12.3.168defun Delay 35 12.3.17defvar StreamNil 35 12.3.17defun incRgen1 35 13.0.17defvar scanKeyWords 35 13.0.17defvar infgeneric 36 13.0.17defun lincoftoks 36 13.0.17defun nextline 36 13.0.17defun scanIgnoreLine 36 13.0.17defun constoken 36 13.0.17defun scanToken 36 13.0.18defun Is it a ++ comment? 36 13.0.18defun Is it a + comment? 36 13.0.18defun Is it a - comment 36 13.0.18defun Is it a - comment? 36 13.0.18defun Infegcomment 36 13.0.18defun punctuation? 36 13.0.18defun scanPunct 36 13.0.18defun substringMatch 36 13.0.19defun scanKeyTr 37			
12.3.16 defun incConsoleInput 35 12.3.16 defun incConsoles 35 12.3.16 defun incNConsoles 35 12.3.16 defun incActive? 35 12.3.16 defun incRegen 35 12.3.16 defun Delay 35 12.3.17 defvar StreamNil 35 12.3.17 defvar StreamNil 35 12.3.17 defun incRgen1 35 13.0.17 defun incRgen1 35 13.0.17 defun incRgen1 35 13.0.17 defun incRgenic 36 13.0.17 defun lineoftoks 36 13.0.17 defun lineoftoks 36 13.0.17 defun nextline 36 13.0.17 defun scanIgnoreLine 36 13.0.17 defun scanIgnoreLine 36 13.0.17 defun scanToken 36 13.0.17 defun scanToken 36 13.0.18 defun scanComment 36 13.0.18 defun scanNegComment 36 13.0.18 defun scanNegComment 36 13.0.18 defun punctuation? 36 13.0.18 defun substringMatch 36 13.0.19 defun scanKeyTr 37			
12.3.16 defun incConsoleInput 35 12.3.16 defun incNConsoles 35 12.3.16 defun incActive? 35 12.3.16 defun incReen 35 12.3.16 defun Delay 35 12.3.17 defvar StreamNil 35 12.3.17 tefun incRgen1 35 13.0.17 tefun incRgen1 35 13.0.17 2lefvar scanKeyWords 35 13.0.17 3lefvar infgeneric 36 13.0.17 3lefun lineoftoks 36 13.0.17 3lefun nextline 36 13.0.17 3lefun scanIgnoreLine 36 13.0.17 3lefun scanIgnoreLine 36 13.0.17 3lefun scanToken 36 13.0.17 3lefun scanToken 36 13.0.18 3lefun Is it a ++ comment? 36 13.0.18 3lefun Is it a ++ comment? 36 13.0.18 3lefun Is it a - comment? 36 13.0.18 3lefun Integcomment 36 13.0.18 3lefun punctuation? 36 13.0.18 3lefun scanPunct 36 13.0.18 3lefun substringMatch 36 13.0.19 3lefun scanKeyTr 37			
12.3.16@lefun incNConsoles 35 12.3.16@lefun incRgen 35 12.3.16@lefun Delay 35 12.3.17@lefvar StreamNil 35 12.3.17dlefun incRgen1 35 13 The Token Scanner 35 13.0.17@lefvar scanKeyWords 35 13.0.17@lefvar infgeneric 36 13.0.17@lefvar infgeneric 36 13.0.17@lefun lineoftoks 36 13.0.17@lefun scanIgnoreLine 36 13.0.17@lefun constoken 36 13.0.17@lefun scanToken 36 13.0.17@lefun scanToken 36 13.0.18@lefun scanComment 36 13.0.18@lefun lis it a ++ comment? 36 13.0.18@lefun scanComment 36 13.0.18@lefun linegcomment 36 13.0.18@lefun punctuation? 36 13.0.18@lefun punctuation? 36 13.0.18@lefun scanPunct 36 13.0.18@lefun subMatch 36 13.0.19@lefun substringMatch 36 13.0.19@lefun scanKeyTr 37			
12.3.167lefun incActive? 35 12.3.168lefun incRgen 35 12.3.170lefun Delay 35 12.3.170lefvar StreamNil 35 12.3.17tlefun incRgen1 35 13.0.17tlefun incRgen1 35 13.0.172lefvar scanKeyWords 35 13.0.173lefvar infgeneric 36 13.0.17defun lineoftoks 36 13.0.17defun nextline 36 13.0.17flefun constoken 36 13.0.17flefun scanIgnoreLine 36 13.0.17flefun scanToken 36 13.0.17flefun scanToken 36 13.0.18flefun scanToken 36 13.0.18flefun lisi t a ++ comment? 36 13.0.18flefun scanComment 36 13.0.18flefun scanNegComment 36 13.0.18flefun punctuation? 36 13.0.18flefun scanPunct 36 13.0.18flefun scanPunct 36 13.0.18flefun subMatch 36 13.0.19flefun substringMatch 36 13.0.19flefun scanKeyTr 37			
12.3.168lefun incRgen 35 12.3.169lefun Delay 35 12.3.170lefvar StreamNil 35 12.3.171lefun incRgen1 35 13 The Token Scanner 35 13.0.172lefvar scanKeyWords 35 13.0.173lefvar infgeneric 36 13.0.173lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.176lefun scanToken 36 13.0.178lefun scanToken 36 13.0.180lefun Isi ta ++ comment? 36 13.0.180lefun Is it a ++ comment? 36 13.0.182lefun Ifcomment 36 13.0.183lefun Isi ta - comment? 36 13.0.183lefun Ifnegcomment 36 13.0.185lefun punctuation? 36 13.0.186lefun scanPunct 36 13.0.188lefun subMatch 36 13.0.190lefun scanKeyTr 37			
12.3.16@lefun Delay 35 12.3.17@lefvar StreamNil 35 12.3.17tlefun incRgen1 35 13 The Token Scanner 35 13.0.17@lefvar scanKeyWords 35 13.0.17@lefvar infgeneric 36 13.0.17@lefun lineoftoks 36 13.0.17@lefun nextline 36 13.0.17@lefun scanIgnoreLine 36 13.0.17@lefun constoken 36 13.0.17@lefun scanToken 36 13.0.17@lefun lfid 36 13.0.18@lefun ls it a ++ comment? 36 13.0.18@lefun scanComment 36 13.0.18@lefun lfcomment 36 13.0.18@lefun scanNegComment 36 13.0.18@lefun punctuation? 36 13.0.18@lefun scanPunct 36 13.0.18@lefun scanPunct 36 13.0.18@lefun subMatch 36 13.0.18@lefun substringMatch 36 13.0.19@lefun scanKeyTr 37			
12.3.17@lefvar StreamNil 35 12.3.17tlefun incRgen1 35 13 The Token Scanner 35 13.0.172lefvar scanKeyWords 35 13.0.173lefvar infgeneric 36 13.0.174lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.177lefun constoken 36 13.0.178lefun scanToken 36 13.0.179lefun lfid 36 13.0.180lefun lis it a ++ comment? 36 13.0.181lefun scanComment 36 13.0.182lefun lfcomment 36 13.0.183lefun ls it a - comment? 36 13.0.183lefun scanNegComment 36 13.0.183lefun punctuation? 36 13.0.183lefun scanPunct 36 13.0.183lefun subMatch 36 13.0.189lefun substringMatch 36 13.0.190lefun scanKeyTr 37			
12.3.17tlefun incRgen1 35 13 The Token Scanner 35 13.0.172lefvar scanKeyWords 35 13.0.173lefvar infgeneric 36 13.0.174lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.178lefun constoken 36 13.0.178lefun scanToken 36 13.0.179lefun lfid 36 13.0.18dlefun Is it a ++ comment? 36 13.0.18dlefun scanComment 36 13.0.18dlefun lfcomment 36 13.0.18dlefun scanNegComment 36 13.0.18dlefun punctuation? 36 13.0.18dlefun scanPunct 36 13.0.18dlefun subMatch 36 13.0.18dlefun substringMatch 36 13.0.19dlefun scanKeyTr 37			
13 The Token Scanner 35 13.0.172lefvar scanKeyWords 35 13.0.173lefvar infgeneric 36 13.0.174lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.176lefun constoken 36 13.0.178lefun scanToken 36 13.0.179lefun lfid 36 13.0.18dlefun Is it a ++ comment? 36 13.0.18dlefun scanComment 36 13.0.18dlefun If foomment 36 13.0.18dlefun Is it a - comment? 36 13.0.18dlefun scanNegComment 36 13.0.18dlefun punctuation? 36 13.0.18dlefun scanPunct 36 13.0.18dlefun subMatch 36 13.0.18dlefun substringMatch 36 13.0.19dlefun scanKeyTr 37			
13.0.172lefvar scanKeyWords 35 13.0.173lefvar infgeneric 36 13.0.174lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.176lefun scanToken 36 13.0.178lefun scanToken 36 13.0.180lefun lfid 36 13.0.181lefun scanComment 36 13.0.182lefun lfcomment 36 13.0.183lefun Is it a - comment? 36 13.0.185lefun scanNegComment 36 13.0.185lefun punctuation? 36 13.0.186lefun punctuation? 36 13.0.188lefun scanPunct 36 13.0.188lefun subMatch 36 13.0.190lefun scanKeyTr 37			
13.0.173lefvar infgeneric 36 13.0.174lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.17flefun constoken 36 13.0.178lefun scanToken 36 13.0.18dlefun Isid 36 13.0.18dlefun Is it a ++ comment? 36 13.0.18tlefun scanComment 36 13.0.18dlefun Is it a - comment? 36 13.0.18dlefun Is it a - comment? 36 13.0.18dlefun scanNegComment 36 13.0.18dlefun punctuation? 36 13.0.18dlefun scanPunct 36 13.0.18dlefun subMatch 36 13.0.19dlefun substringMatch 36 13.0.19dlefun scanKeyTr 37			
13.0.174lefun lineoftoks 36 13.0.175lefun nextline 36 13.0.176lefun scanIgnoreLine 36 13.0.176lefun constoken 36 13.0.178lefun scanToken 36 13.0.179lefun lfid 36 13.0.180lefun Is it a ++ comment? 36 13.0.18tlefun scanComment 36 13.0.18tlefun lfcomment 36 13.0.18tlefun scanNegComment 36 13.0.18tlefun punctuation? 36 13.0.18tlefun scanPunct 36 13.0.18tlefun subMatch 36 13.0.18tlefun subStringMatch 36 13.0.19tlefun scanKeyTr 37	1	0.17 2 lefvar scanKeyWords	9
13.0.17 blefun nextline 36 13.0.17 blefun scanIgnoreLine 36 13.0.17 blefun constoken 36 13.0.17 blefun scanToken 36 13.0.17 blefun lfid 36 13.0.18 blefun Is it a ++ comment? 36 13.0.18 blefun scanComment 36 13.0.18 blefun lfcomment 36 13.0.18 blefun scanNegComment 36 13.0.18 blefun punctuation? 36 13.0.18 blefun scanPunct 36 13.0.18 blefun subMatch 36 13.0.18 blefun substringMatch 36 13.0.19 blefun scanKeyTr 37	1	0.173defvar infgeneric	1
13.0.17@lefun scanIgnoreLine 36 13.0.17@lefun constoken 36 13.0.17@lefun scanToken 36 13.0.17@lefun lfid 36 13.0.18@lefun Is it a ++ comment? 36 13.0.18@lefun scanComment 36 13.0.18@lefun lfcomment 36 13.0.18@lefun scanNegComment 36 13.0.18@lefun lfnegcomment 36 13.0.18@lefun punctuation? 36 13.0.18@lefun scanPunct 36 13.0.18@lefun subMatch 36 13.0.18@lefun substringMatch 36 13.0.19@lefun scanKeyTr 37	1	0.174defun lineoftoks	2
13.0.177lefun constoken 36 13.0.178lefun scanToken 36 13.0.179lefun lfid 36 13.0.180lefun Is it a ++ comment? 36 13.0.181lefun scanComment 36 13.0.182lefun lfcomment 36 13.0.183lefun Is it a - comment? 36 13.0.184lefun scanNegComment 36 13.0.185lefun lfnegcomment 36 13.0.186lefun punctuation? 36 13.0.186lefun scanPunct 36 13.0.188lefun subMatch 36 13.0.189lefun substringMatch 36 13.0.190lefun scanKeyTr 37	1	$0.175 defun next line \dots \dots$	3
13.0.17 Selefun scanToken 36 13.0.17 Mefun lfid 36 13.0.18 Mefun Is it a ++ comment? 36 13.0.18 Hefun scanComment 36 13.0.18 Mefun If fcomment 36 13.0.18 Mefun Is it a - comment? 36 13.0.18 Mefun scanNegComment 36 13.0.18 Mefun punctuation? 36 13.0.18 Mefun scanPunct 36 13.0.18 Mefun subMatch 36 13.0.18 Mefun substringMatch 36 13.0.19 Mefun scanKeyTr 37	1	0.176defun scanIgnoreLine	4
13.0.17 Ølefun Ifid 36 13.0.18 Ølefun Is it a ++ comment? 36 13.0.18 Hefun scanComment 36 13.0.18 Ølefun Ifcomment 36 13.0.18 Ølefun Is it a - comment? 36 13.0.18 Ølefun scanNegComment 36 13.0.18 Ølefun Ifnegcomment 36 13.0.18 Ølefun punctuation? 36 13.0.18 Ølefun scanPunct 36 13.0.18 Ølefun subMatch 36 13.0.18 Ølefun substringMatch 36 13.0.19 Ølefun scanKeyTr 37	1	0.177defun constoken	4
13.0.18@lefun Is it a ++ comment? 36 13.0.18@lefun scanComment 36 13.0.18@lefun Ifcomment 36 13.0.18@lefun Is it a - comment? 36 13.0.18@lefun scanNegComment 36 13.0.18@lefun Ifnegcomment 36 13.0.18@lefun punctuation? 36 13.0.18@lefun scanPunct 36 13.0.18@lefun subMatch 36 13.0.18@lefun substringMatch 36 13.0.19@lefun scanKeyTr 37	1	0.178defun scan Token	5
13.0.18Hefun scanComment 36 13.0.18Zlefun lfcomment 36 13.0.18Zlefun Is it a – comment? 36 13.0.18Zlefun scanNegComment 36 13.0.18Zlefun lfnegcomment 36 13.0.18Zlefun punctuation? 36 13.0.18Zlefun scanPunct 36 13.0.18Zlefun subMatch 36 13.0.18Zlefun substringMatch 36 13.0.19Zlefun scanKeyTr 37	1	0.179defun lfid	6
13.0.182lefun lfcomment 36 13.0.183lefun Is it a – comment? 36 13.0.184lefun scanNegComment 36 13.0.185lefun lfnegcomment 36 13.0.186lefun punctuation? 36 13.0.187lefun scanPunct 36 13.0.188lefun subMatch 36 13.0.189lefun substringMatch 36 13.0.190lefun scanKeyTr 37	1	0.18@defun Is it a ++ comment?	6
13.0.18 defun Is it a - comment? 36 13.0.18 defun scanNegComment 36 13.0.18 defun lfnegcomment 36 13.0.18 defun punctuation? 36 13.0.18 defun scanPunct 36 13.0.18 defun subMatch 36 13.0.18 defun substringMatch 36 13.0.19 defun scanKeyTr 37	1	0.18 tlefun scanComment	6
13.0.184lefun scanNegComment 36 13.0.185lefun lfnegcomment 36 13.0.186lefun punctuation? 36 13.0.187lefun scanPunct 36 13.0.188lefun subMatch 36 13.0.189lefun substringMatch 36 13.0.190lefun scanKeyTr 37]	0.18 2 lefun lfcomment	7
13.0.18 blefun lfnegcomment 36 13.0.18 blefun punctuation? 36 13.0.18 blefun scanPunct 36 13.0.18 blefun subMatch 36 13.0.18 blefun substringMatch 36 13.0.19 blefun scanKeyTr 37]	0.183defun Is it a – comment?	7
13.0.18@lefun punctuation? 36 13.0.18@lefun scanPunct 36 13.0.18@lefun subMatch 36 13.0.18@lefun substringMatch 36 13.0.19@lefun scanKeyTr 37]	0.184lefun scanNegComment	7
13.0.18@lefun punctuation? 36 13.0.18@lefun scanPunct 36 13.0.18@lefun subMatch 36 13.0.18@lefun substringMatch 36 13.0.19@lefun scanKeyTr 37	1	0.185defun lfnegcomment	8
13.0.187lefun scanPunct 36 13.0.188lefun subMatch 36 13.0.189lefun substringMatch 36 13.0.190lefun scanKeyTr 37			8
13.0.18 Mefun substringMatch 36 13.0.19 Mefun scanKeyTr 37		•	8
13.0.18 Mefun substringMatch 36 13.0.19 Mefun scanKeyTr 37]	0.18 % defun sub Match	9
13.0.19@lefun scanKeyTr			9
· ·			0
		0.19 defun kevword	0

13.0.19 2 lefur	n keyword?	371
13.0.19 3 lefur	n scanPossFloat	371
13.0.194defur	n digit?	371
13.0.19 5 lefur	n lfkey	371
13.0.19 6 lefur	n spleI	372
13.0.197defur	n spleI1	372
13.0.19&lefur	n scanEsc	373
13.0.19 9 lefva	ar scanCloser	374
13.0.20@lefur	n scanCloser?	375
13.0.20Hefur	n scanWord	375
13.0.20 2 lefur	n scanExponent	375
13.0.203lefur	n lffloat	376
13.0.204lefm	acro idChar?	377
13.0.20 5 lefur	n scanW	377
13.0.20 6 lefur	n posend	378
13.0.207defur	n scanSpace	378
	n lfspaces	
13.0.20 9 lefur	n scanString	379
13.0.21@lefur	n lfstring	379
	n scanS	
13.0.21 2 lefur	n scanTransform	380
13.0.213defur	n scanNumber	380
13.0.214defur	n rdigit?	381
13.0.21 5 lefur	n lfinteger	382
13.0.21 6 lefur	n lfrinteger	382
13.0.217defur	n scanCheckRadix	382
13.0.218defur	n scanEscape	383
13.0.219defur	n scanError	383
13.0.22@lefur	n lferror	384
13.0.22Hefva	ar scanKeyTable	384
	n scanKeyTableCons	
	ar scanDict	
13.0.22 4 lefur	n scanDictCons	385
13.0.22 5 lefur	n scanInsert	386
13.0.22 6 lefva	ur scanPun	387
	n scanPunCons	
14 Input Stream F		389
	n Input Stream Parser	389
	n npItem	
	n npItem1	
	n npFirstTok	
	Push one item onto \$stack	
	Pop one item off \$stack	
	Pop the second item off \$stack	
14.0.235defur	Pop the third item off \$stack	392

14.0.23@defun	npQualDef	392
$14.0.237 \\ lefun$	Advance over a keyword	392
14.0.23&lefun	Advance the input stream	393
14.0.23 Mefun	npComma	393
14.0.24 defun	npTuple	393
14.0.24tlefun	npCommaBackSet	394
14.0.242lefun	npQualifiedDefinition	394
14.0.243defun	npQualified	394
14.0.244lefun	npDefinitionOrStatement	395
14.0.24 following	npBackTrack	395
14.0.24 6 lefun	npGives	395
14.0.247defun	npLambda	396
14.0.248 $lefun$	npType	396
14.0.24 Mefun	npMatch	397
14.0.25@lefun	npSuch	397
14.0.25llefun	npWith	397
14.0.252lefun	npCompMissing	398
14.0.253lefun	npMissing	398
14.0.25 4 lefun	npRestore	398
14.0.255lefun	Peek for keyword s, no advance of token stream	399
14.0.25@lefun	npCategoryL	399
14.0.257lefun	npCategory	399
14.0.25&lefun	npSCategory	400
	npSignature	
14.0.26@lefun	npSigItemlist	401
14.0.26tlefun	npListing	401
14.0.262lefun	Always produces a list, fn is applied to it	401
14.0.263lefun	npSigItem	402
14.0.26 4 lefun	npTypeVariable	402
14.0.26 defun	npSignatureDefinee	403
14.0.26 Gelefun	npTypeVariablelist	403
14.0.267defun	npSigDecl	403
14.0.26&lefun	npPrimary	403
14.0.269lefun	npPrimary2	404
14.0.27@lefun	npADD	404
14.0.27tlefun	npAdd	405
14.0.272lefun	npAtom2	405
	npInfixOperator	
14.0.274defun	npInfixOp	406
	npPrefixColon	407
	npApplication	407
	npDotted	408
	npAnyNo	408
	npSelector	408
	npApplication2	409
14.0.28Hefun		409

14.0.282 defun npMacro	410
14.0.283defun npMdef	
14.0.284defun npMDEF	
14.0.285defun npMDEFinition	
14.0.286lefun npFix	
14.0.287defun npLet	
14.0.28 lefun npLetQualified	
14.0.28 Mefun npDefinition	
14.0.29@lefun npDefinitionItem	
14.0.29 tlefun npTyping	
14.0.292lefun npDefaultItemlist	
14.0.293lefun npSDefaultItem	
14.0.294lefun npDefaultItem	
14.0.29 fdefun npDefaultDecl	
14.0.29@fun npStatement	
14.0.297defun npExport	
14.0.29 Mertan in properties and the state of the state o	
14.0.29 Alefun npSLocalItem	
14.0.30@lefun npLocalItem	
14.0.30 tlefun npLocalDecl	
14.0.302lefun npLocal	
14.0.303lefun npFree	
14.0.304lefun npInline	
14.0.305defun npIterate	
14.0.30@fun npBreak	
14.0.307defun npLoop	
14.0.30 & lefun npIterators	
14.0.30 Mefun npIterator	
14.0.31@lefun npSuchThat	
14.0.31 Hefun Apply argument 0 or more times	
14.0.312lefun npWhile	
14.0.313defun npForIn	
14.0.314lefun npReturn	
14.0.315defun npVoid	
14.0.31@fun npExpress	
14.0.317defun npExpress1	
14.0.31&lefun npConditionalStatement	
14.0.31% lefun npImport	424
14.0.32@lefun npQualTypelist	
14.0.32 tlefun npSQualTypelist	
14.0.322lefun npQualType	
14.0.323defun npAndOr	
14.0.324lefun npEncAp	
14.0.325defun npEncl	
14.0.32@efun npAtom1	
14.0.327defun npPDefinition	

14.0.328defun	npDollar	427
$14.0.32 {\tt Mefun}$	npConstTok	427
$14.0.33 \\ \text{@} lefun$	npBDefinition	428
	npBracketed	
	npParened	
	npBracked	
	npBraced	
	npAngleBared	
	npDefn	
$14.0.337 \mathrm{lefun}$	npDef	430
	npBPileDefinition	
$14.0.33 {\tt Mefun}$	npPileBracketed	431
	npPileDefinitionlist	
$14.0.34 {\rm Hefun}$	$npListAndRecover \ldots \ldots \ldots \ldots \ldots$	432
	npRecoverTrap	
$14.0.343 \mathrm{lefun}$	npMoveTo	433
$14.0.344 \mathrm{lefun}$	syIgnoredFromTo	434
$14.0.345 \mathrm{defun}$	syGeneralErrorHere	434
$14.0.34 {\tt @lefun}$	sySpecificErrorHere	434
$14.0.347 \mathrm{lefun}$	sySpecificErrorAtToken	435
14.0.34 & lefun	npDefinitionlist	435
$14.0.34 {\tt Mefun}$	npSemiListing	435
$14.0.35 @ \mathrm{lefun}$	npSemiBackSet	435
$14.0.35 \rm Hefun$	npRule	436
$14.0.352 \mathrm{lefun}$	npSingleRule	436
$14.0.353 \mathrm{lefun}$	npDefTail	436
$14.0.354 \mathrm{lefun}$	npDefaultValue	437
$14.0.355 \mathrm{lefun}$	npWConditional	437
$14.0.35 {\tt @lefun}$	npConditional	437
$14.0.357 \\ lefun$	npElse	438
14.0.35 & lefun	npBacksetElse	438
$14.0.35 \mathfrak{A} efun$	npLogical	439
14.0.36 @ lefun	npDisjand	439
$14.0.36 \mathrm{Hefun}$	npDiscrim	439
$14.0.362 \mathrm{lefun}$	npQuiver	439
14.0.363lefun	npRelation	440
$14.0.364 {\rm lefun}$	npSynthetic	440
$14.0.365 \mathrm{lefun}$	npBy	441
$14.0.36 \hbox{\tt Glefun}$		441
$14.0.367 \\ lefun$	npSegment	441
14.0.368 $lefun$	npArith	442
$14.0.36 {\tt Mefun}$	npSum	442
		442
		443
		443
		443

14.0.374defun npAmpersandFrom	443
14.0.375defun npFromdom	444
14.0.376defun npFromdom1	444
14.0.377defun npAmpersand	444
14.0.378lefun npName	445
14.0.379defvar \$npTokToNames	
14.0.38@defun npId	445
14.0.38 tlefun npSymbolVariable	
14.0.382lefun npRightAssoc	
14.0.383 defun p o p o p o p = $(((p \circ p) \circ p) \circ p) \cdot \dots \cdot $	447
14.0.384lefun npInfGeneric	448
14.0.385defun npDDInfKey	
14.0.386defun npInfKey	
14.0.387defun npPushId	449
14.0.38&lefvar npPParg	
14.0.389defun npPP	
14.0.39@lefun npPPff	
14.0.39 tlefun npPPg	
14.0.392lefun npPPf	
14.0.393defun npEnclosed	
14.0.394lefun npState	
14.0.395defun npTrap	
14.0.396defun npTrapForm	
14.0.397defun npVariable	
14.0.398lefun npVariablelist	
14.0.39@lefun npVariableName	
14.0.40@defun npDecl	
14.0.40 Hefun npParenthesized	
14.0.402lefun npParenthesize	
14.0.403defun npMissingMate	
14.0.40 defun npExit	
14.0.405defun npPileExit	
14.0.406lefun npAssign	
14.0.407defun npAssignment	
14.0.40 & Jefun np Assign Variable	
14.0.40 % lefun npColon	
14.0.41@lefun npTagged	
1 00	457
	458
- *-	458
- v - v	458
*	458
- · · · ·	459
*	459
1 11	459
	459

	14.1	Functions on interpreter objects	0
		14.1.1 defmacro mkObj	
		14.1.2 defmacro mkObjWrap	
		14.1.3 defmacro mkObjCode	
		14.1.4 defmacro objSetVal	
		14.1.5 defmacro objSetMode	
		14.1.6 defmacro objVal	
		14.1.7 defmacro objValUnwrap	
		14.1.8 defmacro objMode	
		14.1.9 defun objEnv	
		14.1.10 defmacro objCodeVal	
		14.1.11 defmacro objCodeMode	
	14.2	Macro handling	
		14.2.1 defun phMacro	
		14.2.2 defun macroExpanded	
		14.2.3 defun macExpand	
		14.2.4 defun macApplication	
		14.2.5 defun mac0MLambdaApply	
		14.2.6 defun mac0ExpandBody	
		14.2.7 defun macoInfiniteExpansion	
		14.2.8 defun mac0InfiniteExpansion,name	
		14.2.9 defun mac0GetName	
		14.2.10 defun macId	
		14.2.11 defun mac0Get	
		14.2.12 defun macWhere	
		14.2.13 defun macWhere,mac	
		14.2.13 defun macLambda	
		14.2.15 defun macLambda,mac	
		14.2.16 defun Add appropriate definition the a Macro pform	
		14.2.17 defun Add a macro to the global pfMacros list	
		14.2.17 defun Add a macro to the global phylacros list	
		14.2.19 defun mac0SubstituteOuter	
		14.2.20 defun macLambdaParameterHandling	
		14.2.21 derum macsubstituteid	3
15	Pftr	ees 47	5
10		Abstract Syntax Trees Overview	_
		Structure handlers	
	10.2	15.2.1 defun pfGlobalLinePosn	
		15.2.2 defun pfCharPosn	
		15.2.3 defun pfLinePosn	
		15.2.4 defun pfFileName	
		15.2.5 defun pfCopyWithPos	
		15.2.6 defun pfMapParts	
		15.2.7 defun pf0ApplicationArgs	
		15.2.8 defun pf0FlattenSyntacticTuple	g

		400 To 11.4	
		pfSourcePosition	
		Convert a Sequence node to a list	
		pfSpread	
		Deconstruct nodes to lists	
		pfCheckMacroOut	
		pfCheckArg	
		pfCheckId	
		pfFlattenApp	
		pfCollect1?	
		pfCollectVariable1	
		pfPushMacroBody	
	$15.2.20\mathrm{defun}$	pfSourceStok	484
	$15.2.21\deg un$	pfTransformArg	484
	$15.2.22\deg $	pfTaggedToTyped1	485
	$15.2.23\deg\mathrm{un}$	pfSuch	485
15.3	Special Nodes	- 3	485
	15.3.1 defun	Create a Listof node	485
	15.3.2 defun	pfNothing	486
		Is this a Nothing node?	
15.4	Leaves		486
	15.4.1 defun	Create a Document node	486
		Construct an Id node	
		Is this an Id node?	
	15.4.4 defun	Construct an Id leaf node	487
		Return the Id part	
		Construct a Leaf node	
		Is this a leaf node?	
		Return the token position of a leaf node	
		Return the Leaf Token	
		Is this a Literal node?	
		Create a LiteralClass node	
		Return the LiteralString	
		Return the parts of a tree node	
		Return the argument unchanged	
		pfPushBody	
		An S-expression which people can read	
		Create a human readable S-expression	
		Construct a Symbol or Expression node	
			491
		·	491
		· ·	491
15.5		• -	492
10.0			492
			$492 \\ 492$
			492 493
	13.3.4 derun	pfAttribute	493

15.5.5 defun Return an Application node	
15.5.6 defun Return the Arg part of an Application node	493
15.5.7 defun Return the Op part of an Application node	
15.5.8 defun Is this an And node?	493
15.5.9 defun Return the Left part of an And node	494
15.5.10 defun Return the Right part of an And node	494
15.5.11 defun Flatten a list of lists	494
15.5.12 defun Is this an Application node?	494
15.5.13 defun Create an Assign node	494
15.5.14 defun Is this an Assign node?	495
15.5.15 defun Return the parts of an LhsItem of an Assign node	495
15.5.16 defun Return the LhsItem of an Assign node	495
15.5.17 defun Return the RHS of an Assign node	495
15.5.18 defun Construct an application node for a brace	496
15.5.19 defun Construct an Application node for brace-bars	
15.5.20 defun Construct an Application node for a bracket	
15.5.21 defun Construct an Application node for bracket-bars	
15.5.22 defun Create a Break node	497
15.5.23 defun Is this a Break node?	497
15.5.24 defun Return the From part of a Break node	497
15.5.25 defun Construct a Coerceto node	497
15.5.26 defun Is this a CoerceTo node?	497
15.5.27 defun Return the Expression part of a CoerceTo node	498
15.5.28 defun Return the Type part of a CoerceTo node	498
15.5.29 defun Return the Body of a Collect node	498
15.5.30 defun Return the Iterators of a Collect node	498
15.5.31 defun Create a Collect node	499
15.5.32 defun Is this a Collect node?	499
15.5.33 defun pfDefinition	499
15.5.34 defun Return the Lhs of a Definition node	499
15.5.35 defun Return the Rhs of a Definition node	499
15.5.36 defun Is this a Definition node?	500
15.5.37 defun Return the parts of a Definition node	500
15.5.38 defun Create a Do node	500
15.5.39 defun Is this a Do node?	500
15.5.40 defun Return the Body of a Do node	501
15.5.41 defun Construct a Sequence node	
15.5.42 defun Construct an Exit node	
15.5.43 defun Is this an Exit node?	501
15.5.44 defun Return the Cond part of an Exit	502
15.5.45 defun Return the Expression part of an Exit	
15.5.46 defun Create an Export node	
15.5.47 defun Construct an Expression leaf node	
15.5.48 defun pfFirst	
15.5.49 defun Create an Application Fix node	
15.5.50 defun Create a Free node	503

$15.5.51 \operatorname{defun}$	Is this a Free node?	503
$15.5.52 \operatorname{defun}$	Return the parts of the Items of a Free node	503
$15.5.53 \operatorname{defun}$	Return the Items of a Free node	504
$15.5.54 \operatorname{defun}$	Construct a Forin node	504
	Is this a ForIn node?	
$15.5.56 \operatorname{defun}$	Return all the parts of the LHS of a ForIn node $\dots \dots$	504
	Return the LHS part of a ForIn node	
$15.5.58 \operatorname{defun}$	Return the Whole part of a For In node	505
	pfFromDom	
	Construct a Fromdom node	
	Is this a Fromdom mode?	
	Return the What part of a Fromdom node	
	Return the Domain part of a Fromdom node	
$15.5.64 \operatorname{defun}$	Construct a Hide node	506
$15.5.65 \operatorname{defun}$	pfIf	506
$15.5.66 \operatorname{defun}$	Is this an If node?	507
	Return the Cond part of an If $\ldots \ldots \ldots \ldots \ldots$	
$15.5.68 \operatorname{defun}$	Return the Then part of an If $\ \ldots \ \ldots \ \ldots \ \ldots$	507
$15.5.69 \operatorname{defun}$	pfIfThenOnly	507
$15.5.70 \operatorname{defun}$	Return the Else part of an If	507
$15.5.71 \operatorname{defun}$	Construct an Import node	508
$15.5.72 \operatorname{defun}$	Construct an Iterate node	508
$15.5.73 \operatorname{defun}$	Is this an Iterate node?	508
$15.5.74 \operatorname{defun}$	Handle an infix application	508
$15.5.75 \operatorname{defun}$	Create an Inline node	509
$15.5.76 \operatorname{defun}$	pfLam	509
$15.5.77 \operatorname{defun}$	pfLambda	509
	Return the Body part of a Lambda node \hdots	
$15.5.79 \operatorname{defun}$	Return the Rets part of a Lambda node	510
$15.5.80 \operatorname{defun}$	Is this a Lambda node?	510
	Return the Args part of a Lambda node	
	Return the Args of a Lambda Node	
$15.5.83 \operatorname{defun}$	Construct a Local node	511
	Is this a Local node?	
	Return the parts of Items of a Local node	
$15.5.86 \operatorname{defun}$	Return the Items of a Local node $\ \ldots \ \ldots \ \ldots \ \ldots$	511
$15.5.87 \operatorname{defun}$	Construct a Loop node	512
	pfLoop1	512
$15.5.89 \operatorname{defun}$	Is this a Loop node?	512
$15.5.90 \operatorname{defun}$	Return the Iterators of a Loop node	512
$15.5.91 \operatorname{defun}$	$pf0LoopIterators \dots \dots$	512
	$pfLp \dots \dots \dots \dots \dots \dots \dots \dots \dots $	513
	Create a Macro node	513
		513
$15.5.95 \operatorname{defun}$	Return the Lhs of a Macro node	513
15 5 96 defun	Return the Rhs of a Macro node	514

$15.5.97 \mathrm{defun}$	Construct an MLambda node	514
$15.5.98\mathrm{defun}$	Is this an MLambda node?	514
$15.5.99\mathrm{defun}$	Return the Args of an MLambda	514
15.5.10 defun	Return the parts of an MLambda argument	514
$15.5.10\mathrm{Hefun}$	pfMLambdaBody	515
$15.5.102 \mathrm{lefun}$	Is this a Not node?	515
15.5.103lefun	Return the Arg part of a Not node	515
15.5.104lefun	Construct a NoValue node	515
15.5.105 lefun	Is this a Novalue node?	516
15.5.10 Gelefun	Return the Expr part of a Novalue node	516
15.5.107lefun	Construct an Or node	516
15.5.10&lefun	Is this an Or node?	516
$15.5.10 \mathfrak{A} efun$	Return the Left part of an Or node	516
$15.5.11 \\ \texttt{@lefun}$	Return the Right part of an Or node	517
$15.5.11\mathrm{flefun}$	Return the part of a parenthesised expression	517
15.5.112lefun	pfPretend	517
15.5.113defun	Is this a Pretend node?	517
15.5.114lefun	Return the Expression part of a Pretend node	518
15.5.11 5 lefun	Return the Type part of a Pretend node	518
15.5.11 6 lefun	Construct a QualType node	518
15.5.117lefun	Construct a Restrict node	518
15.5.11 & lefun	Is this a Restrict node?	518
$15.5.11 \mathfrak{A} efun$	Return the Expr part of a Restrict node	519
$15.5.12 \\ \texttt{@lefun}$	Return the Type part of a Restrict node	519
$15.5.12 \mathrm{Hefun}$	Construct a RetractTo node	519
15.5.122lefun	Construct a Return node	519
15.5.123lefun	Is this a Return node?	519
15.5.124lefun	Return the Expr part of a Return node	520
15.5.12 following	pfReturnNoName	520
15.5.12 Gelefun	Construct a ReturnTyped node	520
$15.5.127 \mathrm{lefun}$	Construct a Rule node	520
15.5.12 & lefun	Return the Lhs of a Rule node	521
$15.5.12 \mathfrak{A} efun$	Return the Rhs of a Rule node	521
$15.5.13 \\ \texttt{@lefun}$	Is this a Rule node?	521
$15.5.13\mathrm{Hefun}$	pfSecond	521
15.5.132lefun	Construct a Sequence node	521
15.5.133lefun	Return the Args of a Sequence node	522
15.5.134lefun	Is this a Sequence node?	522
15.5.135 lefun	Return the parts of the Args of a Sequence node	522
15.5.13 Gebeun	Create a Suchthat node	522
$15.5.137 \\ lefun$	Is this a SuchThat node?	523
	Return the Cond part of a SuchThat node	
$15.5.13 \mathfrak{A} e fun$	Create a Tagged node	523
	Is this a Tagged node?	
$15.5.14\mathrm{Hefun}$	Return the Expression portion of a Tagged node	523
15 5 142lefun	Return the Tag of a Tagged node	524

	pfTaggedToTyped		
	pfTweakIf		
15.5.14 5 lefun	Construct a Typed node		525
	Is this a Typed node?		
15.5.147defun	Return the Type of a Typed node		525
15.5.14&lefun	Return the Id of a Typed node		525
15.5.14 % lefun	Construct a Typing node		526
15.5.15@lefun	Return a Tuple node		526
	Return a Tuple from a List		
15.5.15 2 lefun	Is this a Tuple node?		526
15.5.15 3 lefun	Return the Parts of a Tuple node		527
15.5.15 4 lefun	Return the parts of a Tuple		527
15.5.15 5 lefun	Return a list from a Sequence node		527
15.5.15 6 lefun	The comment is attached to all signatutres		527
15.5.157lefun	Construct a WDeclare node		528
15.5.158 $lefun$	Construct a Where node		528
15.5.15 9 lefun	Is this a Where node?		528
15.5.16@lefun	Return the parts of the Context of a Where node		528
15.5.16Hefun	Return the Context of a Where node		528
15.5.162lefun	Return the Expr part of a Where node		529
15.5.16 3 lefun	Construct a While node		529
15.5.164lefun	Is this a While node?		529
15.5.16 5 lefun	Return the Cond part of a While node		529
15.5.16 6 lefun	Construct a With node		530
15.5.167defun	Create a Wrong node		530
15.5.168 $lefun$	Is this a Wrong node?		530
16 DC	1		F 01
16 Pftree to s-expr			531
	Pftree to s-expression translation		
	Pftree to s-expression translation inner function		
	Convert a Literal to an S-expression		
	Change on Application pade to an Separation		
	Change an Application node to an S-expression		
	Convert a SuchThat node to an S-expression		
	pfOp2Sex		
	pmDontQuote?		
	hasOptArgs?		
	Convert a Sequence node to an S-expression		
	pfSequence2Sex0		
	Convert a loop node to an S-expression		
	Change a Collect node to an S-expression		
	Convert a Definition node to an S-expression		
	Convert a Lambda node to an S-expression		546
	pfCollectArgTran		
	Convert a Lambda node to an S-expression		
16.0.18 6 lefun	Convert a Rule node to an S-expression		548

16.0.187 defun	Convert the Lhs of a Rule to an S-expression 549
	Convert the Rhs of a Rule to an S-expression 549
	Convert a Rule predicate to an S-expression 549
	patternVarsOf
	patternVarsOf1
	pvarPredTran
	Convert the Lhs of a Rule node to an S-expression
10.0.19 4 1e1un	Translate ops into internal symbols
17 Stream Utilities	555
	npNull
	StreamNull
18 Code Piles	557
	insertpile
18.0.198 $lefun$	pilePlusComment
18.0.19 9 lefun	pilePlusComments
18.0.20@lefun	pileTree
18.0.20 Hefun	pileColumn
	pileForests
18.0.203lefun	pileForest
	pileForest1
	eqpileTree
	pileCtree
	pileCforest
	enPile
	firstTokPosn
	lastTokPosn
	separatePiles
10.0.211101411	beparated field
19 Dequeue Function	565
19.0.21 2 lefun	dqUnit
19.0.213defun	dqConcat
	dqAppend
	dqToList
00 M II 11'	ran
20 Message Handlin	
20.1 The Line Ob	
	Line object creation
	Line element 0; Extra blanks
	Line element 1; String
	Line element 2; Globlal number
	Line element 2; Set Global number
	Line elemnt 3; Local number
	Line element 4; Place of origin
20.1.8 defun	Line element 4: Is it a filename?

	20.1.9 defun Line element 4: Is it a filename?	
	20.1.10 defun Line element 4; Get filename	569
20.2	Messages	569
	20.2.1 defun msgCreate	569
	20.2.2 defmacro getMsgPosTagOb	570
	20.2.3 defmacro getMsgKey	570
	20.2.4 defmacro getMsgArgL	
	20.2.5 defmacro getMsgPrefix	570
	20.2.6 defmacro setMsgPrefix	
	20.2.7 defmacro getMsgText	
	20.2.8 defmacro setMsgText	
	20.2.9 defmacro getMsgPrefix?	571
	20.2.10 defmacro getMsgTag	
	20.2.11 defmacro getMsgTag?	
	20.2.12 defmacro line?	
	20.2.13 defmacro leader?	
	20.2.14 defmacro toScreen?	
	20.2.15 defun ncSoftError	
	20.2.16 defun ncHardError	
	20.2.17 defun desiredMsg	
	20.2.18 defun processKeyedError	
	20.2.19 defun msgOutputter	
	20.2.20 defun listOutputter	
	20.2.21 defun getStFromMsg	
	20.2.22 defvar \$preLength	
	20.2.23 defun getPreStL	
	20.2.24 defun getPosStL	
	20.2.25 defun ppos	
	20.2.26 defun remFile	
	20.2.27 defun showMsgPos?	
	20.2.28 defvar \$imPrGuys	
	20.2.29 defun msgImPr?	
	20.2.30 defun getMsgCatAttr	
	20.2.31 defun getMsgPos	
	20.2.32 defun getMsgFTTag?	
	20.2.33 defun decideHowMuch	
	20.2.34 defun poNopos?	
	F	580
		580
		581
		581
		581
		582
	5 44 46 47	582
	0	582
	20.2.43 defyer \$toWhereCuys	582

20.2.44 defun getMsgToWhere	
$20.2.45\mathrm{defun}$ to File?	
20.2.46 defun already Opened?	583
$20.2.47 defun\ setMsgForcedAttrList\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\$	583
$20.2.48 defun\ setMsgForcedAttr\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots$	583
$20.2.49 defvar \ \$ attr Cats \ \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	584
$20.2.50\mathrm{defun}$ which Cat	584
$20.2.51 defun\ setMsgCatlessAttr\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\$	584
$20.2.52\mathrm{defun}$ put Database Stuff 	585
$20.2.53\mathrm{defun}$ get MsgInfo From Key	585
$20.2.54 defun\ setMsgUnforcedAttrList \qquad . \ . \ . \ . \ . \ . \ . \ . \ . \ .$	586
$20.2.55 defun\ setMsgUnforcedAttr \ldots \ldots \ldots \ldots \ldots \ldots$	586
$20.2.56 defvar \ \$imPrTagGuys \ \dots $	586
$20.2.57 defun\ init Im Pr \ \dots $	586
$20.2.58\mathrm{defun}$ init To Where	587
$20.2.59\mathrm{defun}$ Report a bug in the compiler	587
$20.2.60\mathrm{defun}\mathrm{processMsgList} \dots \dots$	587
$20.2.61\mathrm{defun}\;\mathrm{erMsgSort}\;\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	588
$20.2.62 defun\ erMsgCompare \qquad . \ . \ . \ . \ . \ . \ . \ . \ . \ .$	588
$20.2.63 defun\ compareposns . \ . \ . \ . \ . \ . \ . \ . \ . \ .$	589
$20.2.64\mathrm{defun}\mathrm{erMsgSep}\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	589
$20.2.65 defun\ makeMsgFromLine . \ . \ . \ . \ . \ . \ . \ . \ . \ .$	
$20.2.66\mathrm{defun}$ rep	590
$20.2.67\mathrm{defun}$ get Line Pos 	590
$20.2.68 defun\ getLineText . \ . \ . \ . \ . \ . \ . \ . \ . \ .$	590
$20.2.69 defun\ queue Up Errors \qquad . \ . \ . \ . \ . \ . \ . \ . \ . \ .$	590
$20.2.70\mathrm{defun}$ this PosIsLess	592
$20.2.71\mathrm{defun}$ this Pos Is Equal	
$20.2.72\mathrm{defun}\mathrm{redundant}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	592
$20.2.73 defvar \ \$repGuys \dots \dots \dots \dots \dots \dots \dots \dots \dots $	593
$20.2.74\mathrm{defun}\mathrm{msgNoRep?}\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	593
$20.2.75\mathrm{defun\ sameMsg?}\dots$	593
$20.2.76\mathrm{defun}\mathrm{processChPosesForOneLine}\ldots\ldots\ldots\ldots\ldots\ldots$	
$20.2.77\mathrm{defun}$ po Char Posn $\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	
$20.2.78\mathrm{defun}$ make Leader Msg 	595
$20.2.79 defun\ posPointers . \ . \ . \ . \ . \ . \ . \ . \ . \ .$	595
$20.2.80\mathrm{defun}\mathrm{getMsgPos2} \dots \dots$	596
$20.2.81\mathrm{defun}$ insert Pos	596
$20.2.82\mathrm{defun}$ put FTText	597
$20.2.83\mathrm{defun}$ From	597
$20.2.84\mathrm{defun}$ To	598
$20.2.85\mathrm{defun}$ From To	598

21 The Interpreter Syntax 59	
21.1 syntax assignment	
21.2 syntax blocks	2
21.3 system clef	4
21.4 syntax collection	5
21.5 syntax for	6
21.6 syntax if	0
21.7 syntax iterate	2
21.8 syntax leave	3
21.9 syntax parallel	4
21.10syntax repeat	6
21.11syntax suchthat	
21.12syntax syntax	
21.13syntax while	
·	
22 Abstract Syntax Trees (ptrees) 62	3
22.0.1 defun Construct a leaf token	3
22.0.2 defun Return a part of a node	4
22.0.3 defun Compare a part of a node	4
22.0.4 defun pfNoPosition?	4
22.0.5 defun poNoPosition?	4
22.0.6 defun tokType	5
22.0.7 defun tokPart	5
22.0.8 defun tokPosn	5
22.0.9 defun pfNoPosition	5
22.0.10 defun poNoPosition	5
23 Attributed Structures 62	-
23.0.11 defun ncTag	7
23.0.12 defun ncAlist	7
23.0.13 defun ncEltQ	8
23.0.14 defun ncPutQ	8
23.0.15 Special Category Names	9
23.0.16 defvar \$EmptyMode	9
23.0.17 defvar \$AnonymousFunction	9
23.0.18 defvar \$Any	0
23.0.19 defvar \$BFtag	0
23.0.20 defvar \$Boolean	0
23.0.21 defvar \$Category	
23.0.22 defvar \$Domain	0
23.0.23 defvar \$Exit	1
23.0.24 defvar \$Expression	1
23.0.25 defvar \$OutputForm	
23.0.26 defvar \$BigFloat	
23.0.27 defvar \$Float	
23.0.28 defvar \$DoubleFloat	

23	$3.0.29 \mathrm{defvar}$	\$FontTable	. 632
23	$3.0.30\mathrm{defvar}$	\$Integer	. 632
23	$3.0.31 \mathrm{defvar}$	\$ComplexInteger	. 632
23	$3.0.32 \mathrm{defvar}$	\$Mode	. 632
23	$3.0.33 \mathrm{defvar}$	\$NegativeInteger	. 632
23	$3.0.34 \mathrm{defvar}$	\$NonNegativeInteger	. 633
25	$3.0.35 \mathrm{defvar}$	\$NonPositiveInteger	. 633
25	$3.0.36\mathrm{defvar}$	\$PositiveInteger	. 633
25	$3.0.37 \mathrm{defvar}$	\$RationalNumber	. 633
25	$3.0.38 \mathrm{defvar}$	\$String	. 633
25	$3.0.39 \mathrm{defvar}$	\$StringCategory	. 633
25	$3.0.40 \mathrm{defvar}$	\$Symbol	. 634
25	$3.0.41 \mathrm{defvar}$	\$Void	. 634
23	$3.0.42 \mathrm{defvar}$	\$QuotientField	. 634
		\$FunctionalExpression	
		\$defaultFunctionTargets	
		\$SmallInteger	
		\$SingleFloat	
		\$DoubleFloat	
		\$SingleInteger	
	ion Selectio		637
24	$4.0.49 \mathrm{defun}$	ofCategory	. 637
		isPartialMode	
24	$4.0.51 \mathrm{defun} \mathrm{l}$	hasCaty	. 638
24	$4.0.52 \mathrm{defun}$	domArg	. 640
24	$4.0.53 \mathrm{defun}$	$domArg2 \dots \dots \dots \dots$. 640
24	$4.0.54 \mathrm{defun} \mathrm{l}$	hasSig	. 640
24	$4.0.55 \mathrm{defun} \mathrm{l}$	hasAtt	. 641
24	$4.0.56\mathrm{defun}$ l	hasSigAnd	. 642
24	$4.0.57 \mathrm{defun} \mathrm{l}$	hasSigOr	. 643
24	$4.0.58 \mathrm{defun} \mathrm{l}$	hasAttSig	. 644
24	$4.0.59 \mathrm{defun} \mathrm{l}$	hasCate1	. 644
24	$4.0.60\mathrm{defun}$ l	hasCatExpression	. 644
24	$4.0.61\mathrm{defun}$ ı	unifyStruct	. 645
24	$4.0.62\mathrm{defun}$ ı	unifyStructVar	. 646
24	$4.0.63 \mathrm{defun}$	contains Vars	. 647
24	$4.0.64 \mathrm{defun}$ i	isPatternVar	. 648
24	$4.0.65 \mathrm{defun}$	containsVars1	. 648
24	$4.0.66 \operatorname{defun} 1$	hasCaty1	. 648
24	$4.0.67 \mathrm{defun}$ 1	mkDomPvar	. 650
24	$4.0.68 \mathrm{defun} \mathrm{l}$	hasCate	. 650
24	$4.0.69 \mathrm{defun}$	constructSubst	. 651
24	$4.0.70 \operatorname{defun} 1$	hasCateSpecial	. 651
24	$4.0.71 \operatorname{defun} 1$	hasCateSpecialNew	. 652
		defaultTargetFE	

$24.0.73 \mathrm{defun}$	isEqualOrSubDomain
0° C	CF 7
25 Coercions	657 coerceInteractive
	coerceInt
	coerceInt0
	coerceInt1
	coerceByFunction
	coerceIntTower
	coerceIntTest
	coerceConvertMmSelection;AL
	coerceConvertMmSelection
	hasCorrectTarget
	coerceIntPermute
	computeTTTranspositions
	permuteToOrder
	$\label{thm:decomposeTypeIntoTower} decomposeTypeIntoTower \ \ . $
	reassembleTowerIntoType
	coerceIntCommute
	$coerce Commute Test \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $
	$coerceInt Table Or Function \\ \ \ldots \\ \ \ldots \\ \ \ \ldots \\ \ \ \ \ \ \ \ \ \$
	coerceByTable
$25.0.93 \operatorname{defun}$	catch Coerce Failure
$25.0.94 \operatorname{defun}$	$coerceIntSpecial \dots \dots$
	$coerceIntByMap \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $
	$coerceIntByMapInner\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\$
$25.0.97 \operatorname{defun}$	coerce Or Throw Failure
$25.0.98 \operatorname{defun}$	coercion Failure
$25.0.99 \operatorname{defun}$	valueArgsEqual?
	$algEqual \ldots \ldots$
25.0.10Hefun	$coerceIntFromUnion \dots \dots$
25.0.10 2 lefun	$coerceInt2Union \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $
25.0.103defun	coerce Branch 2 Union
25.0.104lefun	$coerceIntAlgebraicConstant \\ \ldots \\ $
25.0.105defun	getConstantFromDomain
25.0.10@defun	compareTypeLists
	coerceIntX
25.0.108defun	coerceSubDomain
	coerceImmediateSubDomain
25.0.11@defun	getSubDomainPredicate
	absolutelyCanCoerceByCheating
	coerceOrRetract
	retract2Specialization
	coerceUnion2Branch
	stripUnionTags
	evalSharpOne
	*

		25.0.117defun retractUnderDomain	691
		25.0.11&lefun coerceRetract	691
		25.0.119defun retractByFunction	692
	_		
26		0	95
	26.1	Variables Used	
		26.1.1 defvar \$systemCommands	
		26.1.2 defvar \$syscommands	
		26.1.3 defvar \$noParseCommands	
	26.2	Functions	
		26.2.1 defun handleNoParseCommands	
		26.2.2 defun Handle a top level command	
		26.2.3 defun Split block into option block	
		26.2.4 defun Tokenize a system command	
		26.2.5 defun Handle system commands	
		26.2.6 defun Select commands matching this user level	
		26.2.7 defun No command begins with this string	
		26.2.8 defun No option begins with this string	
		26.2.9 defvar \$oldline	
		26.2.10 defun No command/option begins with this string	
		26.2.11 defun Option not available at this user level	
		26.2.12 defun Command not available at this user level	
		26.2.13 defun Command not available error message	
		26.2.14 defun satisfiesUserLevel	
		$26.2.15\mathrm{defun}$ hasOption	
		26.2.16 defun terminateSystemCommand	704
		26.2.17 defun Terminate a system command	704
		26.2.18 defun commandAmbiguityError	
		26.2.19 defun getParserMacroNames	705
		26.2.20 defun clearParserMacro	705
		26.2.21 defun displayMacro	706
		26.2.22 defun displayWorkspaceNames	706
		26.2.23 defun getWorkspaceNames	707
		26.2.24 defun fixObjectForPrinting	707
		26.2.25 defun displayProperties,sayFunctionDeps	708
		26.2.26 defun displayValue	710
		26.2.27 defun displayType	711
		$26.2.28\mathrm{defun}\mathrm{getAndSay}\ldots\ldots\ldots$	712
		26.2.29 defun displayProperties	712
		26.2.30 defun displayParserMacro	715
			715
			716
			716
			717
		26.2.35 defun Split into tokens delimted by spaces	717
		- · · · · · · · · · · · · · · · · · · ·	718

26.2.37 defun Is the argument string an integer?	
26.2.38 defun Handle parsed system commands	718
26.2.39 defun Parse a system command	719
26.2.40 defun Get first word in a string	719
26.2.41 defun Unabbreviate keywords in commands	719
26.2.42 defun The command is ambiguous error	720
26.2.43 defun Remove the spaces surrounding a string	721
26.2.44 defun Remove the lisp command prefix	
26.2.45 defun Handle the)lisp command	
26.2.46 defun The)boot command is no longer supported	
26.2.47 defun Handle the)system command	
26.2.48 defun Handle the synonym command	
26.2.49 defun Handle the synonym system command	
26.2.50 defun printSynonyms	
26.2.51 defun Print a list of each matching synonym	
26.2.52 defvar \$tokenCommands	
26.2.53 defvar \$InitialCommandSynonymAlist	
26.2.54 defun Print the current version information	
26.2.55 defvar \$CommandSynonymAlist	
26.2.56 defun ncloopCommand	
26.2.57 defun ncloopPrefix?	
26.2.58 defun selectOptionLC	
26.2.59 defun selectOption	
26.3)abbreviations Command	
26.3.1 abbreviations man page	
26.3.2 defun abbreviations	
26.3.3 defun abbreviationsSpad2Cmd	
26.3.4 defun listConstructorAbbreviations	
26.4)boot Command	
26.4.1 boot man page	
26.5)browse Command	
26.5.1 browse man page	
26.6 Overview	
26.7 Browsers, MathML, and Fonts	736
26.8 The axServer/multiServ loop	737
26.9 The)browse command	737
26.10 The server support code	
26.11)cd Command	
26.11.1 cd man page	739
26.12)clear Command	740
26.12.1 clear man page	740
26.12.2 defvar \$clearOptions	741
26.12.3 defun clear	741
$26.12.4\mathrm{defvar}\mathrm{\$clearExcept}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	742
$26.12.5\mathrm{defun}\mathrm{clearSpad2Cmd}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	742
$26.12.6\mathrm{defun}\;\mathrm{clearCmdSortedCaches}\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots\;\;\ldots$	743

26.12.7 defun compiledLookupCheck	
26.12.8 defvar \$functionTable	
26.12.9 defun clearCmdCompletely	744
26.12.1@defun clearCmdAll	745
26.12.1 defun clearMacroTable	746
26.12.12 lefun clear Cmd Except	747
26.12.13defun clearCmdParts	747
26.13) close Command	750
26.13.1 close man page	750
26.13.2 defun queryClients	751
26.13.3 defun close	751
26.14) compile Command	753
$26.14.\overline{1}$ compile man page	753
26.14.2 defvar /editfile	755
26.15)copyright Command	
26.15.1 copyright man page	
26.15.2 defun copyright	
26.15.3 defun trademark	
26.16)credits Command	
$2\overset{'}{6}.16.1$ credits man page	
26.16.2 defun credits	
26.17)describe Command	
26.17.1 describe man page	
26.17.2 defvar \$describeOptions	
26.17.3 defun Print comment strings from algebra libraries	
26.17.4 defun describeSpad2Cmd	
26.17.5 defun cleanline	
26.17.6 defun flatten	
26.18)display Command	
26.18.1 display man page	
26.18.2 defvar \$displayOptions	
26.18.3 defun display	
26.18.4 displaySpad2Cmd	
26.18.5 defun abbQuery	
26.18.6 defun displayOperations	
26.18.7 defun yesanswer	
26.18.8 defun displayMacros	
26.18.9 defun sayExample	
26.18.1@lefun cleanupLine	773
26.19)edit Command	775
26.19.1 edit man page	775
26.19.2 defun edit	776
26.19.3 defun editSpad2Cmd	
	776
	776 777
26.19.4 defun Implement the)edit command	777

26.20.1 fin man page	
26.20.2 defun Exit from the interpreter to lisp	
26.21)help Command	
26.21.1 help man page	
26.21.2 The top level help command	782
26.21.3 The top level help command handler	
$26.21.4\mathrm{defun}$ newHelpSpad2Cmd	783
26.22) history Command	785
26.22.1 history man page	785
26.23Initialized history variables	787
26.23.1 defvar \$oldHistoryFileName	788
26.23.2 defvar \$historyFileType	
26.23.3 defvar \$historyDirectory	
26.23.4 defvar \$useInternalHistoryTable	
26.23.5 defun makeHistFileName	
26.23.6 defun oldHistFileName	
26.23.7 defun histFileName	
26.23.8 defun histInputFileName	
26.23.9 defun initHist	
26.23.1@efun initHistList	
26.23.1 The top level history command	
26.23.12The top level history command handler	
26.23.13 lefun showHistory	
26.23.14lefun setHistoryCore	
26.23.15lefvar \$underbar	
26.23.16 defun writeInputLines	
26.23.17defun resetInCoreHist	
26.23.1\testin changeHistListLen	
26.23.1 Defun updateHist	
26.23.2@lefun updateInCoreHist	
26.23.2 Hefun putHist	
26.23.22lefun recordNewValue	
26.23.23lefun recordNewValue0	
26.23.24lefun recordOldValue	
26.23.25lefun recordOldValue0	
26.23.26lefun undoInCore	
26.23.27defun undoChanges	
26.23.28lefun undoFromFile	
26.23.29 defun saveHistory	
26.23.3@lefun restoreHistory	806
26.23.3 tlefun set IO index	
26.23.32lefun showInput	808
26.23.33lefun showInOut	809
26.23.34lefun fetchOutput	
26.23.3Read the history file using index n	
26.23.36 Write information of the current step to history file	811

26.23.3 Disable history if an error occurred	
26.23.3 Mefun writeHistModesAndValues	
26.23.3 @defun spadrwrite0	
26.23.4 defun Random write to a stream	
26.23.4 defun spadrwrite	
26.23.42defun spadrread	
26.23.43defun Random read a key from a stream 814	
26.23.44lefun unwritable?	
26.23.45defun writifyComplain	
26.23.46defun safeWritify	
26.23.47defun writify,writifyInner	
26.23.4&lefun writify	
26.23.49defun spadČlosure?	
26.23.5@lefvar \$NonNullStream	į
26.23.5tlefvar \$NullStream	ı
26.23.52 lefun dewritify, dewritify Inner	
26.23.53 defun dewritify	
26.23.54lefun ScanOrPairVec,ScanOrInner	
26.23.55defun ScanOrPairVec	
26.23.56defun gensymInt	
26.23.57defun charDigitVal	
26.23.5&lefun histFileErase	
26.24)include Command	
26.24.1 include man page	
26.24.2 defun ncloopInclude1	
26.24.3 Returns the first non-blank substring of the given string 826	
26.24.4 Open the include file and read it in	
26.24.5 Return the include filename	
26.24.6 Return the next token	
26.25)library Command	
26.25.1 library man page	
26.26)license Command	
26.26.1 license man page	
26.26.2 defun license	
26.27)lisp Command	
26.27.1 lisp man page	
26.28)ltrace Command	
26.28.1 ltrace man page	
26.28.2 defun The top level)ltrace function	
26.29)pquit Command	,
26.29.1 pquit man page	,
26.29.2 The top level pquit command	
26.29.3 The top level pquit command handler	
26.30)quit Command	
26.30.1 quit man page	
26.30.2 The top level quit command	

26.30.3 The top level quit command handler	
26.30.4 Leave the Axiom interpreter	
26.31)read Command	
26.31.1 read man page	
26.31.2 defun The)read command	
26.31.3 defun Implement the)read command	
26.31.4 defun /read	
26.32)regress Command	
26.32.1 regress man page	
26.32.2 The regress function details	
$26.32.3 \mathrm{defvar} ^*\mathrm{all\text{-}tests\text{-}ran}^*$	
26.32.4 defun Scan a spool output file for failures	
26.32.5 defun Parse test name from the spool command	
$26.32.6\mathrm{defun}$ Find the next –S marker	
$26.32.7\mathrm{defun}$ Parse out the test number from –S lines $\ldots\ldots\ldots$.	847
$26.32.8 \mathrm{defvar} \mathrm{*ok^*} \ldots \ldots \ldots \ldots \ldots \ldots$	848
26.32.9 defun Compare the computed and expected results	848
26.32.1@lefun Split the calculated and expect results into lists	849
26.32.1 Hefun Returns true on -S lines	850
26.32.12lefun Returns true on –E lines	850
26.32.13lefun Returns true on -R lines	851
26.32.14lefun Returns true on –I lines	851
26.32.15defun Check the last –S line ran	851
26.33)savesystem Command	853
26.33.1 savesystem man page	853
26.33.2 defvar *ThisIsARunningSystem*	853
26.33.3 defun The)savesystem command	854
26.34)set Command	855
26.34.1 set man page	855
26.34.2 Overview	856
26.34.3 Initialize the set variables	856
26.34.4 Reset the workspace variables	857
26.34.5 Display the set option information	
26.34.6 Display the set variable settings	
26.34.7 Translate options values to t or nil	
26.34.8 Translate t or nil to option values	
26.34.9 The list structure	
26.35 set breakmode	
26.35.1 defvar \$BreakMode	863
26.36 set debug	864
26.36.1 set debug lambdatype	864
26.36.2 defvar \$lambdatype	864
26.37 set compiler	865
26.37.1 set compiler output	865
26.37.2 The set output command handler	865
26.37.3 Describe the set output library arguments	
20.01.0 Describe the set output fibrary arguments	000

$26.37.4 \mathrm{def}$ var output-library	
26.37.5 Open the output library	
26.37.6 set compiler input	
26.37.7 The set input library command handler	
26.37.8 Describe the set input library arguments	
26.37.9 Add the input library to the list	
26.37.1@lefvar input-libraries	
26.37.1 Drop an input library from the list	
26.38 set debug dalymode	
26.38.1 defvar dalymode	
26.39 set expose	
26.39.1 functions	
26.39.2 functions cache	
26.39.3 defvar \$cacheAlist	
26.39.4 The top level set functions cache handler 872	
26.39.5 Display a particular cache count	
26.39.6 defun insertAlist	
26.39.7 Describe the set functions cache	
26.39.8 Display all cache counts	
26.39.9 Describe the cache counts	
26.39.1@unctions compile	
26.39.1 Hefvar \$compileRecurrence	
26.40 set fortran	
26.40.1 set ints2floats	
26.40.2 defvar \$fortInts2Floats	
26.40.3 set fortindent	
26.40.4 defvar \$fortIndent	
26.40.5 set fortlength	
26.40.6 defvar \$fortLength	
26.40.7 set typedecs	
26.40.8 defvar \$printFortranDecs	
26.40.9 set defaulttype	
26.40.1@lefvar \$defaultFortranType	
26.40.11set precision	
26.40.12defvar \$fortranPrecision	
26.40.13et intrinsic	
26.40.14defvar \$useIntrinsicFunctions	
26.40.1 s et explength	
26.40.16defvar \$maximumFortranExpressionLength	
26.40.17set segment	
26.40.1&lefvar \$fortranSegment	
26.40.19et optlevel	
26.40.2@lefvar \$fortranOptimizationLevel	
26.40.21set startindex	
26.40.22lefvar \$fortranArrayStartingIndex	
26.40.2 3 et calling	

26.40.24lefvar \$fortranTmpDir	
26.40.25 The top level set fortran calling tempfile handler	
26.40.26 Validate the output directory	
26.40.2 Describe the set fortran calling tempfile	
26.40.28lefvar \$fortranDirectory	
26.40.2 Mefun setFortDir	
26.40.3@lefun describeSetFortDir	
26.40.3 Hefvar \$fortranLibraries	
26.40.32lefun setLinkerArgs	
26.40.33defun describeSetLinkerArgs	. 891
26.41 set hyperdoc	. 891
26.41.1 fullscreen	. 892
26.41.2 defvar \$fullScreenSysVars	. 892
26.41.3 mathwidth	893
26.41.4 defvar \$historyDisplayWidth	
26.42 set help	
26.42.1 fullscreen	
26.42.2 defvar \$useFullScreenHelp	
26.43 set history	
26.43.1 defvar \$HiFiAccess	
26.44 set messages	
26.44.1 set message any	
26.44.2 defvar \$printAnyIfTrue	
26.44.3 set message autoload	
26.44.4 defvar \$printLoadMsgs	
26.44.5 set message bottomup	
26.44.6 defvar \$reportBottomUpFlag	
26.44.7 set message coercion	
26.44.8 defvar \$reportCoerceIfTrue	
26.44.9 set message dropmap	
26.44.1@lefvar \$displayDroppedMap	
26.44.11set message expose	
26.44.12lefvar \$giveExposureWarning	
26.44.13et message file	
26.44.14lefvar \$printMsgsToFile	
26.44.15et message frame	
26.44.16defvar $frameMessages$	
26.44.17et message highlighting	
26.44.1&lefvar \$highlightAllowed	
26.44.19et message instant	
26.44.2 defvar \$reportInstantiations	
26.44.2ket message insteach	
26.44.22 lefvar \$reportEachInstantiation—	
26.44.23et message interponly	
26.44.24lefvar \$reportInterpOnly	
26.44.2 s et message naglink	905

26.44.26defvar \$nagMessages	
26.44.27set message number	
26.44.28defvar \$displayMsgNumber	906
26.44.29et message prompt	
26.44.3@lefvar \$inputPromptType	906
26.44.3 set message selection	907
26.44.3 2 et	907
26.44.33lefvar \$displaySetValue	908
26.44.34et message startup	908
26.44.35defvar \$displayStartMsgs	908
26.44.36 et message summary	909
26.44.37lefvar \$printStatisticsSummaryIfTrue	909
26.44.38et message testing	910
26.44.3 Defvar \$testingSystem	910
26.44.4 9 et message time	910
26.44.4tlefvar \$printTimeIfTrue	911
26.44.42et message type	911
26.44.43defvar \$printTypeIfTrue	911
26.44.4\text{\text{det}} message void	912
26.44.45defvar \$printVoidIfTrue	912
26.45 set naglink	912
26.45.1 set naglink host	913
26.45.2 defvar \$nagHost	913
26.45.3 defun setNagHost	914
26.45.4 defun describeSetNagHost	914
26.45.5 set naglink persistence	914
26.45.6 defvar \$fortPersistence	915
26.45.7 defun setFortPers	915
26.45.8 defun describeFortPersistence	916
26.45.9 set naglink messages	916
26.45.1 9 et naglink double	917
26.45.1 tlefvar \$nagEnforceDouble	
26.46 set output	
26.46.1 set output abbreviate	918
26.46.2 defvar \$abbreviateTypes	919
26.46.3 set output algebra	919
26.46.4 defvar \$algebraFormat	
26.46.5 defvar \$algebraOutputFile	
26.46.6 defvar \$algebraOutputStream	920
	921
	923
	923
	924
. •	926
	926
	926

26.46.14 lefun setOutputFortran
26.46.15defun describeSetOutputFortran
26.46.16et output fraction
26.46.17defvar \$fractionDisplayType
26.46.18et output html
26.46.19defvar \$htmlFormat
26.46.2@lefvar \$htmlOutputFile
26.46.2 Hefun setOutputHtml
26.46.22lefun describeSetOutputHtml
26.46.23et output length
26.46.24lefvar \$margin
26.46.25defvar \$linelength
26.46.26et output mathml
26.46.27defvar \$mathmlFormat
26.46.28defvar \$mathmlOutputFile
26.46.29defun setOutputMathml
26.46.3@lefun describeSetOutputMathml
26.46.3set output openmath
26.46.32lefvar \$openMathFormat
26.46.33lefvar \$openMathOutputFile
26.46.34lefun setOutputOpenMath
26.46.35defun describeSetOutputOpenMath
26.46.36et output script
26.46.37defvar \$formulaFormat
26.46.3&lefvar \$formulaOutputFile
26.46.39defun setOutputFormula
26.46.4@lefun describeSetOutputFormula
26.46.4 set output scripts
26.46.42lefvar \$linearFormatScripts
26.46.43et output showeditor
26.46.44lefvar \$useEditorForShowOutput
26.46.4\set output tex
26.46.46defvar \$texFormat
26.46.47defvar \$texOutputFile
26.46.48defun setOutputTex
26.46.49defun describeSetOutputTex
26.47 quit
26.47.1 defvar \$quitCommandType
26.48 streams
26.48.1 set streams calculate
26.48.2 defvar \$streamCount
$26.48.3\mathrm{defun}\mathrm{setStreamsCalculate}\ldots\ldots............$
26.48.4 defun describeSetStreamsCalculate
26.48.5 set streams showall
26.48.6 defvar \$streamsShowAll
26.49 set system

$26.49.1 \text{set system functioncode} \dots \dots$
26.49.2 defvar \$reportCompilation
26.49.3 set system optimization
26.49.4 defvar \$reportOptimization
26.49.5 set system prettyprint
26.49.6 defvar \$prettyprint
26.50 set userlevel
26.50.1 defvar \$UserLevel
26.50.2 defvar \$setOptionNames
26.51 Set code
26.51.1 defun set
26.51.2 defun set1
26.52)show Command
26.52.1 show man page
26.52.2 defun The)show command
26.52.3 defun The internal)show command
26.52.4 defun reportOperations
26.52.5 defun reportOpsFromLisplib0
26.52.6 defun reportOpsFromLisplib1
26.52.7 defun reportOpsFromLisplib
· · ·
26.52.8 defun isExposedConstructor
26.52.9 defun displayOperationsFromLisplib
26.52.10lefun reportOpsFromUnitDirectly0
26.52.1tlefun reportOpsFromUnitDirectly
26.52.12lefun getOplistForConstructorForm
26.52.13lefun getOplistWithUniqueSignatures
26.52.14lefun reportOpsFromUnitDirectly1
26.52.15defun sayShowWarning
26.53)spool Command
26.53.1 spool man page
26.54)summary Command
26.54.1 summary man page
$26.54.2 defun summary \dots 98$
26.55)synonym Command
26.55.1 synonym man page
26.55.2 defun The)synonym command
26.55.3 defun The)synonym command implementation
26.55.4 defun Return a sublist of applicable synonyms
26.55.5 defun Get the system command from the input line
26.55.6 defun Remove system keyword
26.55.7 defun processSynonymLine
26.56)system Command
26.56.1 system man page
26.57)tangle Command
26.57.1 tangle man page
26.58)trademark Command 99

26.58.1 trademark man page					990
26.59)undo Command					991
26.59.1 undo man page					991
26.60 Evaluation					992
$26.60.1 \mathrm{defun} \mathrm{evalDomain} \ldots \ldots \ldots \ldots \ldots$					993
$26.60.2 \mathrm{defun} \mathrm{mkEvalable} \ldots \ldots \ldots \ldots \ldots$					994
26.60.3 defun mkEvalableUnion					995
26.60.4 defun is Tagged Union					996
26.60.5 defun mkEvalableRecord					996
26.60.6 defun mkEvalableMapping					996
26.60.7 defun evaluateType					996
26.60.8 defun Eval args passed to a constructor					
26.60.9 defvar \$noEvalTypeMsg					1000
26.60.1@lefun throwEvalTypeMsg					1000
26.60.1 Hefun make Ordinal					1000
26.60.12 lefun evaluate Signature					1001
26.60.13defun recordFrame					1001
26.60.14lefun diffAlist					
26.60.15defun clearFrame					1005
26.61)what Command					1006
26.61.1 what man page					1006
26.61.2 defvar \$whatOptions					1007
$26.61.3 \mathrm{defun} \mathrm{what} \ldots \ldots \ldots \ldots \ldots \ldots$					1007
26.61.4 defun what Spad 2 Cmd, fixpat					
26.61.5 defun what Spad 2Cmd					
26.61.6 defun Show keywords for)what command					
26.61.7 defun The)what commands implementation					1010
26.61.8 defun Find all names contained in a pattern					
26.61.9 defun Find function of names contained in pattern .					1011
26.61.1@lefun satisfiesRegularExpressions					1012
26.61.1 Hefun filter And Format Constructors					1012
26.61.12 lefun what Constructors					1013
26.61.1 Display all operation names containing the fragment					1013
26.62)workfiles Command					
26.62.1 workfiles man page					1015
26.62.2 defun workfiles					
26.62.3 defun workfilesSpad2Cmd					1015
27 Handlers for Special Forms				1	017
27.0.4 defun getAndEvalConstructorArgument					
27.0.5 defun replaceSharps					
27.0.6 defun isDomainValuedVariable					
27.0.7 defun evalCategory					
21.011 dotail oral category	 •	 •	 •	•	-010

28 Handling input files	1021
28.0.8 defun Handle .axiom.input file	102
28.0.9 defvar boot-line-stack	
28.0.10 defvar in-stream	102
28.0.11 defvar out-stream	102
28.0.12 defvar file-closed	
28.0.13 defvar echo-meta	
28.0.14 defvar \$noSubsumption	
28.0.15 defvar \$envHashTable	
28.0.16 defun Dynamically add bindings to the environment	
28.0.17 defun Fetch a property list for a symbol from CategoryFrame .	
28.0.18 defun Search for a binding in the environment list	
28.0.19 defun Search for a binding in the current environment	
28.0.20 defun searchTailEnv	
29 Line Handling	1027
29.0.21 Line Buffer	102
29.0.22 defstruct line	102
29.0.23 defvar current-line	102
29.0.24 defmacro line-clear	102
29.0.25 defun line-print	102
$29.0.26 \mathrm{defun} \mathrm{line}\text{-at-end-p} \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	102
29.0.27 defun line-past-end-p	102
29.0.28 defun line-next-char	102
29.0.29 defun line-advance-char	102
29.0.30 defun line-current-segment	102
29.0.31 defun line-new-line	102
29.0.32 defun next-line	103
29.0.33 defun Advance-Char	103
29.0.34 defun storeblanks	103
29.0.35 defun initial-substring	103
29.0.36 defun get-a-line	103
· ·	
30 File Parsing	1033
30.0.37 defun Bind a variable in the interactive environment	
$30.0.38 \mathrm{defvar}$ line-handler	
$30.0.39 \mathrm{defvar} \mathrm{\$spad\text{-}errors} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	103
$30.0.40\mathrm{defvar}$ xtokenreader	103
30.0.41 defun Initialize the spad reader	103
30.0.42 defun spad-syntax-error	
30.0.43 defun spad-long-error	103
30.0.44 defun spad-short-error	103
$30.0.45 \mathrm{defun} \mathrm{spad}\text{-error-loc} \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	103
$30.0.46 \mathrm{defun} iostat \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	103
30.0.47 defun next-lines-show	103
30.0.48 defun token-stack-show	103

	$30.0.49 \mathrm{defun} \mathrm{ioclear} \ldots \ldots \ldots \ldots \ldots \ldots 1037$
31 Han	ling output 1039
31.1	Special Character Tables
	31.1.1 defvar \$defaultSpecialCharacters
	31.1.2 defvar \$plainSpecialCharacters0
	31.1.3 defvar \$plainSpecialCharacters1
	31.1.4 defvar \$plainSpecialCharacters2
	31.1.5 defvar \$plainSpecialCharacters3
	31.1.6 defvar \$plainRTspecialCharacters
	31.1.7 defvar \$RTspecialCharacters
	31.1.8 defvar \$specialCharacters
	31.1.9 defvar \$specialCharacterAlist
	31.1.10 defun Look up a special character code for a symbol
99 Ct	1 DU 11 11 11 10 10 10 10 10 10 10 10 10 10
32 Stre	m and File Handling 1045
	32.0.11 defun make-instream
	32.0.12 defun make-outstream
	32.0.13 defun make-appendstream
	32.0.14 defun defiostream
	32.0.15 defun shut
	32.0.16 defun eofp
	32.0.17 defun makeStream
	32.0.18 defun Construct a new input file name
	32.0.19 defun getDirectoryList
	32.0.20 defun probeName
	32.0.21 defun makeFullNamestring
	32.0.22 defun Replace a file by erase and rename
33 The	Spad Server Mechanism 1049
	33.0.23 defun openserver
34 Axio	m Build-time Functions 1051
	4.0.24 defun spad-save
35 Exp	sure Groups 1053
36 Data	bases 1055
	Database structure
90.1	36.1.1 kaf File Format
	66.1.2 Database Files
	36.1.3 defstruct database
	66.1.4 defvar *defaultdomain-list*
	36.1.5 defvar *operation-hash*
	36.1.6 defvar *hasCategory-hash*
	36.1.7 defvar *miss*
	101111 GOIYUU 111100

36.1.8 Database streams	
36.1.9 defvar *interp-stream*	
$36.1.10 defvar *interp-stream-stamp* \dots \dots \dots \dots \dots \dots \dots$	1060
36.1.11 defvar *operation-stream*	1060
$36.1.12 defvar *operation-stream-stamp* \dots \dots \dots \dots \dots \dots$	1060
$36.1.13 defvar *browse-stream* \dots \dots \dots \dots \dots \dots \dots \dots$	1060
$36.1.14\mathrm{defvar}$ *browse-stream-stamp*	1060
36.1.15 defvar *category-stream*	1061
36.1.16 defvar * category-stream-stamp*	1061
36.1.17 defvar *allconstructors*	
36.1.18 defvar *allOperations*	1061
$36.1.19\mathrm{defun}$ Reset all hash tables before saving system $\ldots\ldots\ldots$	1061
$36.1.20\mathrm{defun}$ Preload algebra into saved system	1062
$36.1.21\mathrm{defun}$ Open the interp database	1064
$36.1.22\mathrm{defun}$ Open the browse database $\ \ldots\ \ldots\ \ldots\ \ldots$	1065
$36.1.23\mathrm{defun}$ Open the category database $\ \ldots\ \ldots\ \ldots\ \ldots$	1066
$36.1.24\mathrm{defun}$ Open the operations database	1067
$36.1.25\mathrm{defun}$ Add operations from newly compiled code $\ldots\ldots\ldots$	1068
$36.1.26\mathrm{defun}$ Show all database attributes of a constructor	1068
$36.1.27\mathrm{defun}$ Set a value for a constructor key in the database	1069
$36.1.28\mathrm{defun}$ Delete a value for a constructor key in the database	1069
$36.1.29\mathrm{defun}$ Get constructor information for a database key $\ \ldots \ \ldots \ \ldots$	1070
$36.1.30\mathrm{defun}$ The)library top level command	1073
$36.1.31\mathrm{defun}$ Read a local file name and update the hash tables $\ \ldots \ \ldots \ \ldots$	1073
$36.1.32\mathrm{defun}$ Update the database from an nrlib index.kaf file	
$36.1.33\mathrm{defun}$ update Database	1077
36.1.34 defvar *sourcefiles*	1077
$36.1.35\mathrm{defun}$ Make new databases	1077
$36.1.36\mathrm{defun}$ save Dependents Hash Table	1081
$36.1.37\mathrm{defun}$ save Users Hash Table	1081
$36.1.38\mathrm{defun}$ Construct the proper database full path name $\ \ldots \ \ldots \ \ldots$	1082
$36.1.39\mathrm{Building}$ the interp. daase from hash tables	
$36.1.40\mathrm{defun}$ Write the interp database $\ \ldots \ \ldots \ \ldots \ \ldots \ \ldots$	1086
$36.1.41\mathrm{Building}$ the browse.daase from hash tables $\ \ldots\ \ldots\ \ldots\ \ldots$	1087
$36.1.42\mathrm{defun}$ Write the browse database	1088
$36.1.43\mathrm{Building}$ the category. daase from hash tables $\ \ldots\ \ldots\ \ldots\ \ldots$	1088
$36.1.44\mathrm{defun}$ Write the category database	1089
$36.1.45\mathrm{Building}$ the operation.daase from hash tables	1089
$36.1.46\mathrm{defun}$ Write the operations database	1089
36.1.47 Database support operations	1090
$36.1.48\mathrm{defun}$ Data preloaded into the image at build time	1090
$36.1.49\mathrm{defun}$ Return all constructors	1090
36.1.50 defun Return all operations	1091

$37 \mathrm{\ Syst}$	em Statistics 1093	
	37.0.51 defun statisticsInitialization	3
37.1	Lisp Library Handling	3
	37.1.1 defun loadLib	3
	37.1.2 defun isSystemDirectory	4
	37.1.3 defun loadLibNoUpdate	5
	37.1.4 defun loadFunctor	5
38 Spe	ial Lisp Functions 1097	
-	38.0.5 defun compiledLookup	7
	38.0.6 defmacro hashCode?	7
	38.0.7 defun basicLookup	7
	38.0.8 defun lookupInDomainVector	9
	38.0.9 defun basicLookupCheckDefaults	9
	38.0.10 defun oldCompLookup	0
	38.0.11 defun NRTevalDomain	0
38.1	Axiom control structure macros	1
	38.1.1 defun put	1
	38.1.2 defmacro while	1
	38.1.3 defmacro whileWithResult	1
38.2	Filename Handling	
	38.2.1 defun namestring	
	38.2.2 defun pathnameName	
	38.2.3 defun pathnameType	
	38.2.4 defun pathnameTypeId	
	38.2.5 defun mergePathnames	
	38.2.6 defun pathnameDirectory	
	38.2.7 defun Axiom pathnames	
	38.2.8 defun makePathname	
	38.2.9 defun Delete a file	
	38.2.10 defun wrap	
	38.2.11 defun lotsof	
	38.2.12 defmacro_startsId?	
	38.2.13 defun hput	
	38.2.14 defmacro hget	
	38.2.15 defun hkeys	
	38.2.16 defun digitp	
	38.2.17 defun pname	
	38.2.18 defun size	_
	38.2.19 defun strpos	6
	38.2.20 defun strposl	-
	38.2.21 defmacro identp	
	38.2.22 defun concat	
	38.2.23 defun canFuncall?	
	38.2.24 defun brightprint	8
	38.2.25 defun brightprint-0	8

38.2.26 defun member	1108
38.2.27 defun messageprint	1109
38.2.28 defun messageprint-1	1109
38.2.29 defun messageprint-2	1109
$38.2.30 \mathrm{defun} \mathrm{sayBrightly1} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 1$	1110
38.2.31 defmacro assq	1110
38.2.32 defun A version of GET that works with lists	
39 Record, Union, Mapping, and Enumeration 11	.11
40 Numeric Function Support 11	13
40.0.33 defmacro fracpart	1113
40.0.34 defun list to complex conversion	
40.0.35 defun complex to list conversion	
40.0.36 defun complex to real conversion	
40.0.37 defmacro FloatError	
$40.0.38$ defun Rational approximation to $\Gamma(x)$	
40.0.39 defun phiRatapprox	
$40.0.40$ defun Log approximation to $\Gamma(x)$	
$40.0.41$ defun Stirling's approximation to $\Gamma(x)$	
40.0.42 defun rgammaImpl	
40.0.43 defun gammaRatapprox	
40.0.44 defun gammaRatkernel	
40.0.45 defun Horner's rule of polynomial evaluation	
$40.0.46$ defun Complex implementation of $\Gamma(z)$	
$40.0.47$ defun Compute the conjugate of $\Gamma(z)$	
$40.0.48$ defun $\Gamma(z)$ negative real branch	
40.0.49 defun PiMinusLogSinPi	
40.0.50 defun cgammaG	
40.0.51 defun logH	
$40.0.52 \text{ defun } \Gamma(z) \text{ positive real branch} \dots \dots$	
40.0.53 defun cgammat	
$40.0.54 \operatorname{defun} \Gamma(z) \operatorname{case} 2 \dots $	
40.0.55 defun logS	
40.0.56 defun Adjust logS if imaginary part is negative	
$40.0.57$ defun $\Gamma(z)$ case 3	
40.0.58 defun cgammaBernsum	
40.0.59 defun Bessell	
40.0.60 defun besselIback	
40.0.61 defun Backward recurrence for Bessel functions	
40.0.62 defun Compute n terms of the chebychev series for f01	
40.0.63 defun chebf01coefmake	
40.0.64 defun chebstarevalarr	
40.0.65 defun lncgamma	
40.0.66 defun rPsiImpl	
40.0.67 defun cotdiffeval	

	40.0.68 defun Amos' w function
	40.0.69 defun PsiAsymptoticOrder
	40.0.70 defun PsiBack
	$40.0.71\mathrm{defvar}$ PsiAsymptoticBern
	40.0.72 defun PsiAsymptotic
	40.0.73 defun PsiEps
	40.0.74 defun PsiIntpart
	40.0.75 defun cPsiImpl
	40.0.76 defun PsiXotic
	40.0.77 defun BesselJ
	40.0.78 defun Asymptotic series for BesselJ
	40.0.79 defun BesselasymptA
	40.0.80 defun BesselasymptB
	40.0.81 defun BesselJRecur
	40.0.82 defun BesselJAsymptOrder
	40.0.83 defun chebf01
Con	nmon Lisp Algebra Support 1137
41.1	AlgebraicFunction
	41.1.1 defun retract
41.2	Any
	41.2.1 defun spad2BootCoerce
41.3	ApplicationProgramInterface
	41.3.1 defun Report what domains get instantiated
41.4	
	41.4.1 defun The Boolean = function support
41.5	Char
	41.5.1 defun upcase
	41.5.2 defun downcase
41.6	ComplexDoubleFloatMatrix
	41.6.1 defmacro make-cdouble-matrix
	41.6.2 defmacro cdaref2
	41.6.3 defmacro cdsetaref2
	41.6.4 defmacro cdanrows
	41.6.5 defmacro cdancols
41.7	ComplexDoubleFloatVector
	41.7.1 defmacro make-cdouble-vector
	41.7.2 defmacro cdelt
	41.7.3 defmacro cdsetelt
	41.7.4 defmacro cdlen
41.8	Database
	41.8.1 defun Database elt function support
41.9	DirectProduct
5	41.9.1 defun vec2list
41.10) DoubleFloat
	41 10 1 defmacro DFLessThan 1144
	41.1 41.2 41.3 41.4 41.5 41.6 41.7

	$\label{loss} Double Float Special Functions$	
4	1.11.1 defun Real Gamma $\Gamma(x)$	1144
4	1.11.2 defun Complex Gamma $\Gamma(z)$	1144
4	1.11.3 defun The complex logGamma function	1145
	1.11.4 defun The real logGamma function	
	1.11.5 defun The real Psi function	
	1.11.6 defun The complex Psi function	
	1.11.7 defun The real BesselJ function	
	1.11.8 defun The complex BesselJ function	
	1.11.9 defun The real Bessell function	
	1.11.10defun The complex BesselI function	
	1.11.1 defun The complex hypergeometric function	
	1.11.12lefmacro DFUnaryMinus	
	1.11.13lefmacro DFMinusp	
	1.11.14defmacro DFZerop	
	1.11.15lefmacro DFAdd	
	1.11.16defmacro DFSubtract	
	1.11.17defmacro DFMultiply	
	1.11.1.18lefmacro DFIntegerMultiply	
	1.11.19defmacro DFMax	
	1.11.2@efmacro DFMin	
	1.11.2tlefmacro DFEql	
	1.11.22lefmacro DFDivide	
	1.11.23lefmacro DFIntegerDivide	
	1.11.24lefmacro DFSqrt	
	1.11.23defmacro DFLogE	
	1.11.26defmacro DFLog	
	1.11.2 definació DF Log	
	1.11.28lefmacro DFExpt	
	1.11.20defmacro DFExp	
	1.11.2 Melmacro DF Exp	
	1.11.3 definació DF Cos	
	1.11.32lefmacro DFTan	
	1.11.33defmacro DF fan	
	.1.11.34defmacro DFAcos	
	1.11.34emacro DFAcos	
	1.11.36defmacro DFStan2	
_		
	1.11.38defmacro DFCosh	
	1.11.39defmacro DFTanh	
	1.11.40defmacro DFAsinh	
	1.11.4 definacro DFAcosh	
	1.11.42lefmacro DFAtanh	
	1.11.43 lefun Machine specific float numerator	
	1.11.44 defun Machine specific float denominator	
4	1.11.45defun Machine specific float sign	-1155

41.11.46 lefun Machine specific float bit length	155
41.11.47defun Decode floating-point values	
41.11.48defun The cotangent routine	155
41.11.49defun The inverse cotangent function	156
41.11.50 defun The secant function	156
41.11.5 Hefun The inverse secant function	156
41.11.52 lefun The cosecant function	156
41.11.53 defun The inverse cosecant function	157
41.11.54 lefun The hyperbolic cosecant function	157
41.11.55 defun The hyperbolic cotangent function	157
41.11.56 defun The hyperbolic secant function	157
41.11.57defun The inverse hyperbolic cosecant function	157
41.11.5 Selefun The inverse hyperbolic cotangent function	
41.11.59defun The inverse hyperbolic secant function	158
41.12 DoubleFloatMatrix	
41.12.1 defmacro make-double-matrix	158
41.12.2 defmacro make-double-matrix1	158
41.12.3 defmacro daref2	159
41.12.4 defmacro dsetaref2	
41.12.5 defmacro danrows	
41.12.6 defmacro dancols	
41.13 DoubleFloatVector	
41.13.1 defmacro dlen	
41.13.2 defmacro make-double-vector	
41.13.3 defmacro make-double-vector1	
41.13.4 defmacro delt	
41.13.5 defmacro dsetelt	
41.14 File	
41.14.1 defvar *read-place-holder*	
41.14.2 defun placep	
41.14.3 defun vmread	
41.15 FileName	
41.15.1 defun FileName filename function implementation	
41.15.2 defun FileName filename support function	
41.15.3 defun FileName directory function implementation	
41.15.4 defun FileName directory function support	
41.15.5 defun FileName name function implementation	
41.15.6 defun FileName extension function implementation	
	163
	163
	163
	163
	164
	164
	164
	164
TO A COLUMN THURS HEW THURSON SHIPPOND	1114

41.16.3 defmacro bit-to-truth	1165
41.16.4 defmacro bvec-elt	
$41.16.5\mathrm{defmacro}$ by ec-setelt	1165
41.16.6 defmacro bvec-size	1165
41.16.7 defun IndexedBits concat function support	1165
41.16.8 defun IndexedBits copy function support	1166
41.16.9 defun IndexedBits = function support	1166
41.16.1@lefun IndexedBits < function support	1166
41.16.1 defun IndexedBits And function support	1166
41.16.12lefun IndexedBits Or function support	1166
41.16.13lefun IndexedBits xor function support	
41.16.14 lefun IndexedBits nand function support	
41.16.15defun IndexedBits nor function support	
41.16.16defun IndexedBits not function support	1167
41.17 IndexCard	
41.17.1 defun IndexCard origin function support	
41.17.2 defun IndexCard origin function support	
41.17.3 defun IndexCard elt function support	
41.18IndexedString	
41.18.1 defun genum	
41.19InputForm	
41.19.1 defun called by interpret function	
41.19.2 defun called by interpret function	
41.19.3 defun called by interpret function	
41.19.4 defun unparseInputForm	
41.20 Integer	
41.20.1 defun Integer divide function support	
41.20.2 defun Integer quo function support	
41.20.3 defun Integer quo function support	
41.20.4 defun Integer random function support	
41.21 KeyedAccessFile	
41.21.1 defun KeyedAccessFile defstream function support	
41.21.2 defun KeyedAccessFile defstream function support	
41.22 NumberFormats	
41.22.1 defun ncParseFromString	
41.23 OperationsQuery	
41.23.1 defun OperationQuery getDatabase function support	
41.24 ParametricLinearEquations	
41.24.1 defun algCoerceInteractive	
41.25 Plot3d	
41.25.1 defvar \$numericFailure	1173
41.25.2 defvar \$oldBreakMode	
41.25.3 defmacro_trapNumericErrors	
41.26 SingleInteger	
41.26.1 defun qsquotient	
41.26.2 defun gsremainder	

41.26.3 defmacro qsdifference
41.26.4 defmacro qslessp
41.26.5 defmacro qsadd1
41.26.6 defmacro qssub1
41.26.7 defmacro qsminus
41.26.8 defmacro qsplus
41.26.9 defmacro qstimes
41.26.1@lefmacro qsabsval
41.26.1 tlefmacro gsoddp
41.26.12lefmacro qszerop
41.26.13lefmacro qsmax
41.26.14lefmacro qsmin
41.27 Table
41.27.1 defun Table InnerTable support
41.28U8Vector
41.28.1 defmacro qvlenU8
41.28.2 defmacro eltU8
41.28.3 defmacro seteltU8
41.28.4 defun getRefvU8
41.29U16Vector
41.29.1 defmacro qvlenU16
41.29.2 defmacro eltU16
41.29.3 defmacro seteltU16
41.29.4 defun getRefvU16
41.30U32Vector
41.30.1 defmacro qvlenU32
41.30.2 defmacro eltU32
41.30.3 defmacro seteltU32
41.30.4 defun getRefvU32
41.31U8Matrix
41.31.1 defmacro aref2U8
41.31.2 defmacro setAref2U8
41.31.3 defmacro arrowsU8
41.31.4 defmacro ancolsU8
41.31.5 defmacro makeMatrixU8
41.31.6 defmacro makeMatrix1U8
41.32U16Matrix
41.32.2 defmacro setAref2U16
41.32.3 defmacro anrowsU16
41.32.4 defmacro ancolsU16
41.32.5 defmacro makeMatrixU16
41.32.6 defmacro makeMatrix1U16
41.33 U32Matrix
41.33.1 defmacro aref2U32
41 33 2 defenders set Aref91132

	$41.33.3 \mathrm{defmacro}$ as	$arowsU32 \dots$		 	 	 	1183
	41.33.4 defmacro a						
	$41.33.5 \mathrm{defmacro} \mathrm{m}$	ıakeMatrixU32 .		 	 	 	1183
	$41.33.6\mathrm{defmacro}$ m	akeMatrix1U32		 	 	 	1183
	41.34 U32VectorPolyno	mialOperations .		 	 	 	1184
	41.34.1 defmacro q	sMulAdd6432		 	 	 	1184
	41.34.2 defmacro qu						
	41.34.3 defmacro qu	sMod6432		 	 	 	1184
	41.34.4 defmacro qu	$_{ m sMulAddMod6432}$		 	 	 	1185
	41.34.5 defmacro qu	sMul6432		 	 	 	1185
	41.34.6 defmacro qu	$sDot26432 \dots$		 	 	 	1185
	41.34.7 defmacro qu	sDot2Mod6432.		 	 	 	1185
	41.35Void			 	 	 	1185
	41.35.1 defun void V	/alue		 	 	 	1185
42	2 OpenMath						1187
	42.1 A Technical Overv						
	42.1.1 The OpenN						
	42.1.2 OpenMath						
	42.1.3 Content Die						
	42.1.4 OpenMath						
	42.2 Technical Details						
	42.3 The Structure of the						
	42.4 OpenMath Express						
	42.4.1 Expressions	·		 	 	 	1193
	42.4.2 Symbols.						
	42.4.3 Encoding a						
	42.5 Big Integers			 	 	 	1194
	42.6 Functions Dealing						
	42.7 Functions to Write						
	42.7.1 Beginning a						
	42.7.2 Writing Bas	sic Objects		 	 	 	1195
	42.7.3 Writing Str						
	42.8 Functions to Extra	•					
	42.8.1 Testing the						
	42.8.2 Extracting						
	42.9 Comments in the S	,					
	42.10 I/O Functions for	Devices		 	 	 	1200
	42.11 Communications						
	42.11.1 Functions t	o Initiate an OMco	nn	 	 	 	1201
	42.12 Parameters						
	42.13 Miscellaneous Fu	actions and Variab	oles	 	 	 	1203
	42.14 The OM.h header						
	42.15 Axiom OpenMath	stub functions		 	 	 	1211
	$42.15.1\mathrm{Axiom\ spec}$						
	42.15.2 defun om-R	ead		 	 	 	1212

42.15.3 defun om-listCDs	
42.15.4 defun om-listSymbols	1212
42.15.5 defun om-supportsCD	1212
42.15.6 defun om-supportsSymbol	1213
42.15.7 Lisp conversion functions	1213
42.15.8 defun om-setDevEncoding	1213
42.15.9 Device manipulation functions	1213
42.15.10defun om-openFileDev	1213
42.15.1 Hefun om-openStringDev	1214
42.15.12lefun om-closeDev	
42.15.1 Connection manipulation functions	
42.15.14lefun om-makeConn	1214
42.15.15defun om-closeConn	
42.15.16defun om-getConnInDev	1215
42.15.17defun om-getConnOutDev	
42.15.1 Client/Server functions	
42.15.19defun om-bindTCP	
42.15.20defun om-connectTCP	
42.15.2 Device input/output functions	
42.15.2 2 lefun om-getApp	
42.15.23lefun om-getAtp	
42.15.24lefun om-getAttr	
42.15.25defun om-getBind	
42.15.26defun om-getBVar	
42.15.27lefun om-getByteArray	
42.15.28defun om-getEndApp	
42.15.29defun om-getEndAtp	
42.15.3@defun om-getEndAttr	
42.15.3Hefun om-getEndBind	
42.15.32lefun om-getEndBVar	
42.15.33defun om-getEndError	
42.15.34lefun om-getEndObject	
42.15.35defun om-getError	
42.15.36defun om-getFloat	
42.15.37defun om-getInt	
42.15.3&lefun om-getObject	
42.15.3 Mefun om-getString	
42.15.4@defun om-getSymbol	
42.15.4 tlefun om-get Type	1221
42.15.4 2 lefun om-getVar	1221
42.15.43defun om-putApp	1221
42.15.44lefun om-putAtp	1221
42.15.45defun om-putAttr	1222
42.15.46defun om-putBind	1222
42.15.47defun om-putBVar	1222
42.15.48Jefun om-putByteArray	1222

	42.15.4 @defun om-putEndApp
	42.15.5@lefun om-putEndAtp
	42.15.5 tlefun om-putEndAttr
	42.15.5 2 lefun om-putEndBind
	42.15.53defun om-putEndBVar
	42.15.54lefun om-putEndError
	42.15.55defun om-putEndObject
	42.15.56defun om-putError
	42.15.57defun om-putFloat
	42.15.5 defun om-putInt
	42.15.5 Mefun om-putObject
	42.15.6@lefun om-putString
	42.15.6 tlefun om-putSymbol
	42.15.6 2 lefun om-putVar
	42.15.63defun om-stringToStringPtr
	42.15.64lefun om-stringPtrToString
43 NF	LIB code.lisp support code 1227
	43.0.65 defun makeByteWordVec2
	43.0.66 defmacro spadConstant
44 Ma	onitoring execution 1229
44 WIC	44.0.67 defvar *monitor-domains*
	44.0.68 defvar *monitor-nrlibs*
	44.0.69 defvar *monitor-table*
	44.0.70 defstruct monitor-data
	44.0.71 defstruct libstream
	44.0.72 defun Initialize the monitor statistics hashtable
	44.0.73 defun End the monitoring process, we cannot restart
	44.0.74 defun Return a list of the monitor-data structures
	44.0.75 defun Add a function to be monitored
	44.0.76 defun Remove a function being monitored
	44.0.77 defun Enable all (or optionally one) function for monitoring 1237
	44.0.78 defun Disable all (optionally one) function for monitoring 1238
	44.0.79 defun Reset the table count for the table (or a function) 1238
	44.0.80 defun Incr the count of fn by 1
	44.0.81 defun Decr the count of fn by 1
	44.0.82 defun Return the monitor information for a function
	44.0.83 defun Hang a monitor call on all of the defuns in a file 1240
	44.0.84 defun Return a list of the functions with zero count fields 1240
	44.0.85 defun Return a list of functions with non-zero counts
	44.0.86 defun Write out a list of symbols or structures to a file
	44.0.87 defun Save the *monitor-table* in loadable form
	44.0.88 defun restore a checkpointed file
	44.0.89 defun Printing help documentation
	44.0.90 Monitoring algebra files

	44.0.91 defun Monitoring algebra code.lsp files	1244
	44.0.92 defun Monitor autoloaded files	
	44.0.93 defun Monitor an nrlib	1245
	44.0.94 defun Given a monitor-data item, extract the nrlib name	1245
	44.0.95 defun Is this an exposed algebra function?	
	44.0.96 defun Monitor exposed domains	
	44.0.97 defun Generate a report of the monitored domains	
	44.0.98 defun Parse an)abbrev expression for the domain name	
	44.0.99 defun Given a spad file, report all nrlibs it creates	
	44.0.10@lefun Print percent of functions tested	
	44.0.10 the find all monitored symbols containing the string	
	44.0.10 thertin Find an infolitored symbols containing the string	1249
45 Hyr	perDoc	1251
	Hyperdoc macro handling and util.ht	1251
	45.1.1 defvar \$htMacroTable	
	45.1.2 defvar \$primitiveHtCommands	
	45.1.3 defvar \$newPage	
	45.1.4 defun Build the table of hyperdoc macros	
	45.1.5 defun Get new command name and number of args	
	45.1.6 defun Is the first string a prefix of the second?	
	49.1.0 detail is the first string a prenx of the second:	1204
46 Hyr	perDoc Basic Command support	1255
46.1	Calculus	1255
	46.1.1 defun Calculus - Differentiate	1256
	46.1.2 defun bcDifferentiateGen	1257
	46.1.3 defun Calculus - Do an Indefinite Integral	1257
	46.1.4 defun bcIndefiniteIntegrateGen	1258
	46.1.5 defun Calculus - Do a Definite Integral	1259
	46.1.6 defun bcDefiniteIntegrateGen	
	46.1.7 defun Calculus - Find a limit	
	46.1.8 defun Calculus - Do a summation	
	46.1.9 defun bcSumGen	
46.2	Matrix	
	46.2.1 defun Basic Commands - Matrix	
46.3	Draw	
10.0	46.3.1 defun Basic Commands - Draw	
	46.3.2 defun Draw - Function of one variable	
	46.3.3 defun bcDraw2DfunGen	
	46.3.4 defun Draw - Parametrically defined curve	
	46.3.5 defun bcDraw2DparGen	
	46.3.6 defun Draw - Solution to a polynomial equation	
	46.3.7 defun bcDraw2DSolveGen	
	46.3.8 defun Draw - Function of two variables	
		12(2
	46.3.9 defun bcDraw3DfunGen	
	46.3.10 defun Draw - Parametrically defined tube	

	46.3.12 defun Draw - Parametrically defined surface	. 1274
	46.3.13 defun bcDraw3Dpar1Gen	
46.4	Series	
10.1	46.4.1 defun Basic Commands - Series	
	46.4.2 defun Series - Expansion	
	46.4.3 defun bcSeriesExpansionGen	
	46.4.4 defun Series - Formula	
	46.4.5 defun Series - Formula - Taylor Series	
	46.4.6 defun bcTaylorSeriesGen	
	46.4.7 defun bcSeriesGen	
	46.4.8 defun Series - Formula - Laurent Series	
	46.4.9 defun bcLaurentSeriesGen	
	46.4.10 defun Series - Formula - Puiseux Series	
	46.4.11 defun bcPuiseuxSeriesGen	
	46.4.12 defun Solve Basic Command	
	46.4.13 defun Solve - System of Linear Equations	
	46.4.14 defun System of Linear Equations - Directly as equations	
	46.4.15 defun bcLinearSolveEqns1	
	46.4.16 defun System of Linear Equations - In matrix form	
	46.4.17 defun System of Linear Equations - In matrix form direct	
	46.4.18 defun Solve System of Linear Equations Individual	
	46.4.19 defun System of Linear Equations In matrix form by formula	
	46.4.20 defun Solve - System of Polynomial Equations	
	46.4.21 defun bcSystemSolveEqns1	
	46.4.22 defun bcInputSolveInfo	
	46.4.23 defun Solve - Single Polynomial Equation	
	10.1.20 detail police single i olynomiai Equation	. 1201
	perDoc Reference	1295
	Book	
47.2	Topics	. 1295
	47.2.1 Numbers	
	47.2.2 Polynomials	
	47.2.3 Functions	
	47.2.4 Solving Equations	. 1296
	47.2.5 Calculus	. 1296
	47.2.6 Linear Algebra	
	47.2.7 Graphics	. 1296
	47.2.8 Algebra	. 1296
47.3	Language	. 1297
	Examples	
47.5	Commands	. 1297
47.6	Glossary	. 1297
47.7	Hyperdoc	. 1297
47.8	Search	. 1297
48 Hyp	perDoc Topics	1299

49	HyperDoc	Browse	1301
50	HyperDoc	Examples	1303
51	HyperDoc	Settings	1305
52	HyperDoc	About	1307
53	HyperDoc	What's New	1309
54	HyperDoc	Support Functions	1311
	54.1 Handli	ng page creation and deletion	. 1311
	54.1.1	defvar \$activePageList	. 1311
	54.1.2	defun htp Make Empty Page	. 1311
	54.1.3	defun htp Destroy Page $\ \ldots \ \ldots \ \ldots \ \ldots \ \ldots \ \ldots$. 1311
		ng Axiom command execution	
		defun Basic Command result page	
		$\ defun\ ht Make Doit Button\ \ .\ $	
	54.2.3	defun Execute a command from Hyperdoc	. 1313
		defun Execute a string in the interpreter	
		ons creating pages	
		defun Basic Command Matrix by Formula generate	
		defun Basic Command generate explicit matrix	
		defun Basic Command generate matrix	
		defun Basic Command iteration	
		defun Sum Basic Command	
		$\ defun\ bc Product Gen\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .$	
		defun Read Matrix	
		defun bcSeriesByFormulaGen	
		defun Real Limit Basic Command	
		defun Real Limit Basic Command options	
		defun bcRealLimitGen1	
		defun Complex Limit Basic Command	
		defun bcComplexLimitGen	
		defvar \$systemType	
		defvar \$numberOfEquations	
		defvar \$solutionMethod	
		defun bcInputEquations	
		defun Create a variable string	
		defun bcMakeUnknowns	
		defun bcMakeEquations	
		defun bcMakeLinearEquations	
		defun bcInputEquationsEnd	
		defun bcSolveEquationsNumerically	
		defun bcSolveNumerically1	
	54.3.25	defun bcSolveEquations	. 1327

54.3.26 defun Linear Solve Basic Command options
54.3.27 defun bcLinearExtractMatrix
54.3.28 defun Linear Solve Basic Command Inhomogeneous
54.3.29 defun bcLinearSolveMatrixInhomoGen
54.3.30 defun bcLinearSolveMatrixHomo
54.3.31 defun bcLinearMatrixGen
54.3.32 defun linearFinalRequest
54.3.33 defun explainLinear
54.3.34 defun finalExactRequest
54.3.35 defun bcLinearSolveEqnsGen
54.3.36 defun bcGenEquations
54.3.37 defun Output the final formula
54.3.38 defun convert arguments into function call syntax
54.3.39 defun bcString2HyString2
54.3.40 defun bcString2HyString
54.3.41 defun find a character position in a string
54.3.42 defun Basic Command result page – NAG version
54.3.43 defun bcOptional
54.3.44 defun create a vertical space on a page
54.3.45 defun break a string into words
54.3.46 defun format words into a string
54.3.47 defun format a vector
54.3.48 defun format an error message
54.3.49 defun format intervals
54.3.50 defun Basic Command page not ready
54.3.51 defun pad a string with blanks
54.3.52 defun construct a name string
54.3.53 defun construct a name string
54.3.54 defvar \$bcParseOnly
54.3.55 defvar \$htLineList
54.3.56 defvar \$curpage
54.3.57 HTPage Layout
54.3.58 defun htpName
54.3.59 defun htpSetName
54.3.60 defun htpDomainConditions
54.3.61 defun htpSetDomainConditions
54.3.62 defun htpDomainVariableAlist
54.3.63 defun htpSetDomainVariableAlist
54.3.64 defun htpDomainPvarSubstList
54.3.65 defun htpSetDomainPvarSubstList
54.3.66 defun htpRadioButtonAlist
54.3.67 defun htpButtonValue
54.3.70 defun htpSetInputAreaAlist
54.3.71 defun htpAddInputAreaProp

$54.3.72\mathrm{defun}\mathrm{htpPropertyList}\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	1342
54.3.73 defun htpProperty	1342
54.3.74 defun htpSetProperty	1342
54.3.75 defun htpLabelInputString	
$54.3.76\mathrm{defun}\mathrm{htpLabelFilteredInputString}\ldots\ldots\ldots\ldots\ldots.$	
54.3.77 defun replacePercentByDollar,fn	1343
54.3.78 defun replacePercentByDollar	
$54.3.79 defun\ htpSetLabelInputString\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\$	1343
$54.3.80\mathrm{defun}\mathrm{htpLabelSpadValue}\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	1344
$54.3.81 defun\ htpSetLabelSpadValue \ \ldots \ldots \ldots \ldots \ldots$	1344
$54.3.82\mathrm{defun}$ htp Label Error Msg	1344
$54.3.83\mathrm{defun}$ htp Set Label Error Msg	1344
$54.3.84 defun\ htpLabelType\ \dots$	1345
$54.3.85\mathrm{defun}$ htp LabelDefault	1345
54.3.86 defun htpLabelSpadType	1345
54.3.87 defun htpLabelFilter	1345
54.3.88 defun htpPageDescription	
54.3.89 defun htpSetPageDescription	1346
54.3.90 defun htpAddToPageDescription	1346
54.3.91 defun issue a single hypertex line or group of lines	
54.3.92 defun bcHt	1347
54.3.93 defun htSay	1347
54.3.94 defun bcIssueHt	1348
54.3.95 defun mapStringize	1348
54.3.96 defun basicStringize	1348
54.3.97 defun stringize	
54.3.98 defun htInitPage	1349
54.3.99 defun htInitPageNoScroll	1349
54.3.10@lefun htSayStandard	
54.3.10 Hefun htSayBind	
54.3.10 2 lefun htAddHeading	1350
54.3.103defun htShowPage	
54.3.104 lefun show the page which has been computed	1351
54.3.105defun make a page given the description in itemList	
54.3.10@defun htMakePage1	1351
54.3.107defun htMakeErrorPage	1352
54.3.10&lefun htQuote	
54.3.10 Mefun htProcessToggleButtons	1353
54.3.11@defun htProcessBcButtons	1354
54.3.11 Hefun htProcessBcStrings	1355
54.3.112lefun bcSadFaces	1356
54.3.113lefun htLispLinks	1356
54.3.114lefun htLispMemoLinks	1357
54.3.115defun htBcLinks	1357
54.3.116defun htBcLispLinks	1358
54.3.117 of up before After	1358

54.3.11&lefun r	mkCurryFun	1359
54.3.119defun h	ntRadioButtons	1359
54.3.12@lefun h	ntBcRadioButtons	1360
54.3.12Hefun s	setUpDefault	1361
54.3.122lefun b	outtonNames	1362
54.3.123defun h	ntInputStrings	1362
54.3.124lefun h	ntProcessDomainConditions	1363
54.3.125defun r	renamePatternVariables	1364
54.3.126defun r	renamePatternVariables1	1364
54.3.127defun s	substFromAlist	1365
	computeDomainVariableAlist	
	ovarCondList	
	ovarCondList1	
-	ovarsOfPattern	
	ntMakeTemplates,substLabel	
	ntMakeTemplates	
	templateParts	
	ntMakeDoneButton	
	ntProcessDoneButton	
	ntMakeButton	
	ochtMakeButton	
	ntProcessDoitButton	
	ntDoneButton	
	typeCheckInputAreas	
	checkCondition	
	condErrorMsg	
	parseAndEval	
	parseAndEval1	
	oldParseString	
	makeSpadCommand	
	ntMakeInputList	
	oracketString	
	quoteString	
	\$funnyQuote	
	\$funnyBacks	
	ntEscapeString	
	ntsv	
	ntSetVars	
	ntShowSetTree	
54.3.157defun h		
54.3.15&lefun h	ntShowSetTreeValue	
	mkSetTitle	
	istOfStrings2String	
	ntShowSetPage	
	ntShowLiteralsPage	
	ntSetLiterals	

54.3.164defun htSetLiteral	1385
54.3.16 defun htShowIntegerPage	1386
54.3.16@lefun htSetInteger	1386
54.3.167defun htShowFunctionPage	1387
54.3.16 Mefun htShowFunctionPageContinued	1387
54.3.16 Welfun ht Setvar Done Button	
54.3.17@lefun htFunctionSetLiteral	1389
54.3.17 tlefun htSetFunCommand	1389
54.3.172lefun htSetFunCommandContinue	
54.3.173lefun htKill	
54.3.174lefun htSetNotAvailable	
54.3.175lefun htDoNothing	
54.3.176defun htCheck	
54.3.177lefun parseWord	
54.3.178lefun htCheckList	
54.3.179lefun translateYesNoToTrueFalse	
54.3.18@lefun chkNameList	
54.3.18tlefun chkPosInteger	
54.3.182lefun chkOutputFileName	
54.3.183lefun chkDirectory	
54.3.184lefun chkNonNegativeInteger	
54.3.185defun chkRange	
54.3.186defun chkAllNonNegativeInteger	
54.3.187lefun htMakePathKey,fn	
54.3.18&lefun htMakePathKey	
54.3.189defun htMarkTree	
54.3.19@lefun htSetHistory	
54.3.194lefun htSetOutputLibrary	
54.3.192lefun htSetInputLibrary	
54.3.193lefun htSetExpose	
54.3.194lefun htSetOutputCharacters	
54.3.195lefun htSetLinkerArgs	
54.3.19@lefun htSetCache	
54.3.197lefun htCacheAddChoice	
54.3.19&lefun htMakeLabel	
54.3.19@lefun htCacheSet	
54.3.20@lefun htAllOrNum	
54.3.20 Hefun htCacheOne	
$54.3.202 lefvar \ \$ history Display Width \ \ldots \ldots \ldots \ldots \ldots \ldots$	1402
54.3.203 defvar \$newline	1402
54.3.204lefun downlink	1402
$54.3.20 \\ \texttt{Mefun dbNonEmptyPattern} $	1402
54.3.20 defun ht System Variables, gn	1403
54.3.207 lefunht System Variables, fn $\ \ldots \ \ldots \ \ldots \ \ldots \ \ldots \ \ldots$	1403
$54.3.20 \& lefun \ ht System Variables, display Options \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	1403
54.3.209lefun htSystemVariables functionTail	1405

	54.3.21@lefun htSystemVariables	. 1405
	54.3.21 Hefun htSetSystemVariableKind	
	54.3.212lefun htSetSystemVariable	. 1408
	54.3.213defun htGloss	
	54.3.214defun htGlossPage	. 1408
	54.3.215defun gatherGlossLines	. 1410
	54.3.216defun htGlossSearch	
	54.3.217defun htGreekSearch	. 1412
	54.3.218lefun htTextSearch	
	54.3.21 Alefun ht Tutorial Search	. 1416
	54.3.22@defun mkUnixPattern	
55 E	Browser Support Code	1419
5	55.1 Pages Initiated from HyperDoc Pages	. 1419
	55.1.1 Search routines	
	55.1.2 defun dKind	. 1419
	55.1.3 defun checkFilter	
	55.1.4 defun Concatenate words with blanks	. 1420
	55.1.5 defun Make constructor names lowercase	
	55.1.6 defun string2Constructor	
	55.1.7 defvar dbDelimiters	
	55.1.8 defun String to words respecting delimiters	
	55.1.9 defun Next word respecting delimiters	
	55.1.10 defun Hyperdoc category search	
	55.1.11 defun Hyperdoc default domain search	
	55.1.12 defun Hyperdoc domain search	
	55.1.13 defun Hyperdoc package search	
	55.1.14 defun Hyperdoc constructor search	
	55.1.15 defun Hyperdoc default constructor search	
	55.1.16 defun Read libdb.text at file-position n	
	55.1.17 defun String trim with newlines removed	
	55.1.18 defun Hyperdoc common constructor search	
	55.1.19 defun conSpecialString?	
	55.1.20 Page construction	
	55.1.21 defun conPage	
	55.1.22 defun gets line quickly for constructor name or abbreviation	
	55.1.23 defun conPageConEntry	
	55.1.24 defun kdPageInfo	
	55.1.25 defun kArgPage	
	55.1.26 defun mkDomTypeForm	
	55.1.27 defun domainDescendantsOf	
5	55.2 Branches of Constructor Page	
9	55.2.1 defun kiPage	
	55.2.2 defun kePage	
	55.2.3 defun kePageOpAlist	
	55.2.4 defun kePageDisplay	1436

	55.2.5 defun ksPage	437
	55.2.6 defun dbSearchOrder	438
	55.2.7 defun kcPage	
	55.2.8 defun kcpPage	442
	55.2.9 defun reduce AlistForDomain	443
	55.2.10 defun kcaPage	443
	55.2.11 defun kcdPage	443
	55.2.12 defun kcdoPage	444
	55.2.13 defun kcaPage1	444
	55.2.14 defun kccPage	445
	55.2.15 defun augmentHasArgs	446
	55.2.16 defun kcdePage	
	55.2.17 defun getDependentsOfConstructor	
	55.2.18 defun kcuPage	448
	55.2.19 defun getUsersOfConstructor	
	55.2.20 defun kcnPage	
	55.2.21 defun koPageInputAreaUnchanged?	
	55.2.22 defun kDomainName	
	55.2.23 defun kArgumentCheck	
	55.2.24 defun dbMkEvalable	
	55.2.25 defun topLevelInterpEval	
	55.2.26 defun kisValidType	
	55.2.27 defun kCheckArgumentNumbers	
	55.2.28 defun parseNoMacroFromString	
	55.2.29 defun mkConform	
55.3	Operation Page for a Domain Form from Scratch	
	55.3.1 defun conOpPage	
	55.3.2 defun conOpPage1	
	55.3.3 defun dbCompositeWithMap	
	55.3.4 defun dbExtractUnderlyingDomain	
55.4	Operation Page from Main Page	
	55.4.1 defun koPage	
	55.4.2 defun koPageFromKKPage	
	55.4.3 defun koPageAux	
	55.4.4 defun koPageAux1	
	55.4.5 defun koaPageFilterByName	
55.5	Get Constructor Documentation	
00.0	55.5.1 defun dbConstructorDoc,hn	
		460
		460
	,	461
		461
		461
	· ·	462
		463
	,	463
	50.0.0 detail disconsocianie,gii	100

		55.5.10 defun dbGetDocTable	L464
		55.5.11 defun kTestPred	464
		55.5.12 defun dbAddChainDomain	465
		55.5.13 defun dbSubConform	465
		55.5.14 defun dbAddChain	466
	55.6	Constructor Page Menu	466
		55.6.1 defun dbShowCons	466
		55.6.2 defun conPageChoose	467
		55.6.3 defun dbShowCons1	467
		55.6.4 defun dbConsExposureMessage	469
		55.6.5 defun dbShowConsKindsFilter	470
		55.6.6 defun dbShowConsDoc	
		55.6.7 defun dbShowConsDoc1	470
		55.6.8 defun getConstructorDocumentation	471
		55.6.9 defun dbSelectCon	
		55.6.10 defun dbShowConditions	
		55.6.11 defun dbConsHeading	
		55.6.12 defun dbShowConstructorLines	
		55.6.13 defun bcUnixTable	
		55.6.14 Special Code for Union, Mapping, and Record	
		55.6.15 defun dbSpecialDescription	
		55.6.16 defun dbSpecialOperations	
		55.6.17 defun dbSpecialExports	
		55.6.18 defun dbSpecialExpandIfNecessary	
		55.6.19 defun lefts	
		55.6.20 Build Library Database (libdb.text,)	
		55.6.21 defun dbMkForm	
		55.6.22 defun libConstructorSig	482
	TT: 11		
56			185
	56.1	Utility functions	
		56.1.1 defun Delete an alist pair given the key	
		56.1.2 defun readline	
		56.1.3 defun isWrapped	.485
57	The	Proofs 14	187
58	The	Interpreter 14	189
۲n	TD1	Clobal Variables	91
9		Global Variables 15 Star Global Variables	31 1521
	99.1		
		59.1.1 *eof*	
		59.1.3 *package*	
		1 0	
		59.1.4 *standard-input*	
		59.1.5 *standard-output*	د332∟

59.1.6 *to	p-level-hook*		 	 	 	 . 1532
	bal Variables					
59.2.1 \$bo	oot		 	 	 	 . 1535
59.2.2 co€	erceFailure		 	 	 	 . 1535
59.2.3 \$cu	ırrentLine		 	 	 	 . 1535
59.2.4 \$di	splayStartMsgs		 	 	 	 . 1535
59.2.5 \$er	MsgToss		 	 	 	 . 1535
59.2.6 \$fr	$ameRecord \dots \dots$. 1535
$59.2.7 \sin$	tRestart		 	 	 	 . 1535
$59.2.8 \sin$	tTopLevel		 	 	 	 . 1536
59.2.9 \$IC	Oindex		 	 	 	 . 1536
$59.2.10 \mathrm{\$la}$	stPos		 	 	 	 . 1536
59.2.11 \$lil	oQuiet		 	 	 	 . 1536
$59.2.12\mathrm{\$m}$	sgDatabaseName .		 	 	 	 . 1536
59.2.13 \$no	eMsgList		 	 	 	 . 1536
$59.2.14\mathrm{\$ne}$	ewcompErrorCount		 	 	 	 . 1536
59.2.15 \$no	pos		 	 	 	 . 1536
	dHistoryFileName.					
59.2.17 \$ol	«ToExecuteMachineC	ode .	 	 	 	 . 1537
59.2.18 \$op	otions		 	 	 	 . 1537
59.2.19 \$pr	reviousBindings		 	 	 	 . 1537
$59.2.20\mathrm{\$re}$	portundo		 	 	 	 . 1537
59.2.21 \$ sp	oad		 	 	 	 . 1537
$59.2.22\$ ext{S}_{1}$	padServer		 	 	 	 . 1537
$59.2.23\mathrm{\$S_{I}}$	padServerName		 	 	 	 . 1537
59.2.24 \$sy	rstemCommandFunct	ion .	 	 	 	 . 1538
$59.2.25 \mathrm{top}$	_level		 	 	 	 . 1538
59.2.26 \$qı	ıitTag		 	 	 	 . 1538
59.2.27 \$us	seInternalHistoryTab	le	 	 	 	 . 1538
Signatures						1539
Bibliography						1541
Index						1545

Volume 6: Axiom Command

1	Ove	rview		1
2	The	axiom	Command	3
		2.0.1	[-ht -noht]	3
		2.0.2	[-gr -nogr]	3
		2.0.3	[-clef -noclef]	4
		2.0.4	[-noiw -iw]	4
		2.0.5	[-ihere -noihere]	5
		2.0.6	[-nox]	5
		2.0.7	[-go -nogo]	6
		2.0.8	[-ws wsname]	6
		2.0.9	[-list]	6
			[-grprog fname]	6
			[-htprog fname]	6
			[-clefprog fname]	7
			[-sessionprog fname]	7
				7
			[-clientprog fname]	7
		2.0.15	[-h]	1
3	The	sman p	program	15
	3.1	include	e files	15
		3.1.1	include/sman.h	16
		3.1.2	include/com.h	17
		3.1.3	include/bsdsignal.h	19
		3.1.4		19
		3.1.5	, -	19
		3.1.6	,	19
		3.1.7	,	20
	3.2			$\frac{1}{21}$
		3.2.1		$^{-1}$
		3.2.2		$\frac{-1}{21}$
		3.2.3		$\frac{-1}{23}$
		3.2.4	1 0	$\frac{-5}{25}$
		3.2.5		$\frac{25}{25}$
		3.2.6		$\frac{26}{26}$
		3.2.7	•	$\frac{20}{26}$
		3.2.8		$\frac{20}{26}$
		3.2.9		$\frac{20}{27}$
				$\frac{27}{27}$
		-		21 27
				21 28
				28 28
			· ·	20 20
		.) 4 14	CIEAU IIIO OIIO SOCKEIS	7.9

		fork_you	9
	3.2.16	exec_command_env	0
	3.2.17	spawn_of_hell	0
	3.2.18	start_the_spadclient	1
	3.2.19	start_the_local_spadclient	1
	3.2.20	start_the_session_manager	2
	3.2.21	start_the_hypertex	2
	3.2.22	start_the_graphics	2
		fork_Axiom	3
	3.2.24	start_the_Axiom	4
		clean_up_sockets	
		read_from_spad_io	
	3.2.27	read_from_manager	
		manage_spad_io	
		init_spad_process_list	
	3.2.30	print_spad_process_list	8
		find_child	
		kill_all_children	
		clean_up_terminal	
		monitor_children	
		main sman	
	3.2.36	sman.c	1
4 5		Routines 45 hand Completion	3
5	THE ATEMI	an program 46	J
6	The hyper	tex program 47	7
7	The clef	program 49	9
8	The sessi	on program 51	1
		n	1
	8.1.1	includes	1
	8.1.2	variables	1
	8.1.3	usr1_handler	
	8.1.4	usr2_handler	2
	8.1.5	term_handler	
	8.1.6	pr	3
	8.1.7	close_client	3
	8.1.8	read_SpadServer_command	
	8.1.9	test_sock_for_process	
	8.1.10	read_menu_client_command	6
	8.1.11	read_from_spad_io	
		kill_spad	

CC	ONTE	ENTS																									93
		8.1.13																									
		8.1.14																									
		8.1.15		_	-																						
		8.1.16																									
		8.1.17	ses	sion	1.				•	٠	•		•			 •	٠	•	 ٠	•	•	•	 •	٠	٠	•	62
9	The	spadc	lier	ıt p	orc	gra	am	ı																			65
	9.1	spadcl	ient											 						•							65
10	The	Comr	nan	.d (Coi	mp	let	io	n	Li	st	;															67
11	Res	earch '	Гор	ics																							145
	11.1	Proofs												 													145
	11.2	Indefin	nites											 													145
	11.3	Provis	os .																								145
12	Mal	kefile																									147
Bi		_																									149

Volume 7: Axiom Hyperdoc

	The Original Plan External Variables hypertex htsearch spadbuf hthits ex2ht htadd hypertex language ertex Call Graph ide include/actions.h	29
1.3 1.4 1.5 1.6 1.7 1.8 The	hypertex	29
1.4 1.5 1.6 1.7 1.8 The Hyp	htsearch spadbuf hthits ex2ht htadd htypertex language ertex Call Graph	29
1.5 1.6 1.7 1.8 The Hyp	spadbuf hthits ex2ht htadd hypertex language ertex Call Graph	29
1.6 1.7 1.8 The Hyp	hthits ex2ht htadd htypertex language ertex Call Graph	29
1.7 1.8 The Hyp	ex2ht	29
1.8 The	htaddhtaddhypertex language ertex Call Graph	. 29 8:
The Hyp	hypertex language ertex Call Graph	29 81
Hyp	ertex Call Graph	29 81
incl	ide	8:
4.1	include/actions.h	0
	,	
4.2		
4.3		
4.4		
4.5	, , , , -	
	, e -	
	,	
	,	
	,	
	4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.10 4.11 4.12 4.13 4.14 4.15 4.16 4.17 4.18 4.19 4.20 4.21 4.22 4.23 4.24 4.25 4.26 4.27	4.2 include/rgb.h 4.3 include/spadcolors.h 4.4 include/addfile.h1 4.5 include/all-hyper-proto.h1 4.6 include/bsdsignal.h 4.7 include/bsdsignal.h1 4.8 include/com.h

	4.29	include/hthits.h1
	4.30	include/htinp.h1
	4.31	include/hyper.h1
		include/initx.h1
		include/input.h1
		include/item.h1
		include/keyin.h1
		include/lex.h1
		include/macro.h1
		include/mem.h1
		include/parse-aux.h1
		include/parse.h1
		include/parse-input.h1
		include/parse-paste.h1
		include/parse-types.h1
		include/pixmap.h1
		include/prt.h1
		$include/readbitmap.h1 \dots \dots$
	4.47	$include/scrollbar.h1 \dots \dots \dots \dots \dots \dots \dots \dots \dots $
	4.48	include/show-types.h1
	4.49	include/sockio-c.h1
	4.50	include/spadbuf.h1
	4.51	include/spadcolors.h1
		include/spadint.h1
		include/titlebar.h1
		include/util.h1
		include/wct.h1
	1.00	
5	Shar	red Code 115
		5.0.1 BeStruct
	5.1	Shared Code for file handling
		5.1.1 strpostfix
		5.1.2 extendHT
		5.1.3 buildHtFilename
		5.1.4 pathname
		5.1.5 htFileOpen
		5.1.6 dbFileOpen
	- 0	5.1.7 tempFileOpen
	5.2	Shared Code for Hash Table Handling
		5.2.1 halloc
		5.2.2 hashInit
		5.2.3 freeHash
		5.2.4 hashInsert
		5.2.5 hashFind
		$5.2.6 hash Replace \dots \qquad \qquad 122$
		5.2.7 hashDelete

		5.2.8	hashMap
		5.2.9	hashCopyEntry
		5.2.10	hashCopyTable
		5.2.11	stringHash
		5.2.12	stringEqual
		5.2.13	allocString
	5.3	Shared	Code for Error Handling
		5.3.1	jump
		5.3.2	$dumpToken \dots \dots$
		5.3.3	printPageAndFilename
		5.3.4	printNextTenTokens
		5.3.5	printToken
		5.3.6	tokenName
		5.3.7	htperror
	5.4	Shared	Code for Lexical Analyzer
		5.4.1	parserInit
		5.4.2	initScanner
		5.4.3	saveScannerState
		5.4.4	restoreScannerState
		5.4.5	ungetChar
		5.4.6	getChar
		5.4.7	getChar1
		5.4.8	ungetToken
		5.4.9	getToken
		5.4.10	pushBeStack
		5.4.11	checkAndPopBeStack
		5.4.12	clearBeStack
		5.4.13	beType
		5.4.14	beginType
		5.4.15	endType
		5.4.16	keywordType
		5.4.17	getExpectedToken
		5.4.18	spadErrorHandler
			resetConnection
		5.4.20	spadBusy
		5.4.21	connectSpad
	5.5	htadd s	hared code
	5.6	hyperte	x shared code
6	Sha	red incl	ude files 153
-	6.1		153
	6.2	_	/hyper.h
			v ±

7	The	spadb	uf function										165
	7.1	spadbı	ıf Call Graph										165
	7.2	Consta	ants and Headers										166
		7.2.1	System includes										166
		7.2.2	Local includes										166
	7.3	externs	3										167
	7.4	local v	ariables										167
	7.5	Code .											167
		7.5.1	spadbufInterHandler .										168
		7.5.2	spadbufFunctionChars										168
		7.5.3	interpIO										168
		7.5.4											169
		7.5.5	main										170
8			function										173
	8.1		Call Graph										
	8.2		Source Code										
	8.3		ints and Headers										
		8.3.1	System includes										
		8.3.2	Local includes										
	8.4												
	8.5		ariables										
	8.6												
		8.6.1	allocString										
		8.6.2	strPrefix										
		8.6.3	getExTitle										
		8.6.4	ехТоНt										
		8.6.5	emitHeader										177
		8.6.6	emitFooter										178
		8.6.7	emitMenuEntry										
		8.6.8	$\operatorname{emitSpadCommand}$.										
		8.6.9	openCoverPage										
			closeCoverPage										
		8.6.11	closeCoverFile										179
		8.6.12	emitCoverLink										179
		8.6.13	addFile										180
		8.6.14	main										180
^	m.	14 11	1										101
9			command										181 181
	9.1		Call Graph										-
	9.2		ents and Headers										
		9.2.1	System includes										
		9.2.2	structs										
		9.2.3	Local includes										
		9.2.4	extern references										
		9.2.5	defines										186

		9.2.6	forward declarati	ons		 														. 187
		9.2.7	local variables . $$.			 														. 187
	9.3	The Sh	nared Code			 														. 188
	9.4	Code .				 														. 188
		9.4.1	parseArgs			 														. 188
		9.4.2	writable			 														. 189
		9.4.3	buildDBFilename	e		 														. 189
		9.4.4	$add file \dots \dots$. 190
		9.4.5	updateDB			 														. 192
		9.4.6	addNewPages			 														. 193
		9.4.7	copyFile			 														. 194
		9.4.8	getFilename																	
		9.4.9	deleteFile																	
		9.4.10	deleteDB																	
			main																	
10	The	hthits	function																	199
	10.1	hthits	Call Graph			 														. 199
	10.2	Consta	nts and Headers.			 														. 200
		10.2.1	System includes.			 														. 200
			defines																	
			structs																	
			Local includes																	
			local variables																	
			cmdline																	
			handleHtdb																	
			handleFile																	
			handleFilePages																	
			$\frac{1}{1}$ handle Page																	
			searchPage																	
			squirt																	
			splitpage																	
			untexbuf																	
			badDB																	
			regerr																	
			main																	
		10.2.11		• •	•	 • •	•		•		 •	 •	 •	•	•	•	•	•		. 200
11	The	hyper	tex command																	209
			nts and Headers .			 														
	-		System includes .																	
	11.2																			
			Local includes																	-
	11.3																			
																				_
			3																	
			oriobles	• •	•	 • •	•	•	•	• •	 •	 •	 •	•	•		•	•	•	$\frac{214}{917}$

11.11Format and Display a page	. 257
11.11.1 showPage	. 257
11.11.2 exposePage	. 259
11.11.3 scrollPage	. 260
11.11.4 pastePage	. 260
11.12Event Handling	. 261
$11.12.1 \mathrm{mainEventLoop} \ldots \ldots \ldots \ldots \ldots \ldots \ldots$. 261
$11.12.2\mathrm{handleEvent}$. 263
11.12.3 create Window	. 265
11.12.4 quitHyperDoc	. 265
11.12.5 findPage	. 266
11.12.6 downlink	. 267
11.12.7 memolink	. 267
11.12.8 killAxiomPage	. 267
11.12.9 killPage	. 268
11.12.10 teturnlink	. 268
11.12.11uplink	. 268
11.12.12 windowlink Handler	. 269
11.12.13makeWindowLink	. 269
11.12.14 ispwindowlink Handler	. 269
11.12.15pasteButton	
11.12.1 6 nelpForHyperDoc	
11.12.17 ind Button In List	
11.12.1&getHyperLink	
11.12.19 handle Button	
11.12.2@xitHyperDoc	
11.12.2ketWindow	
11.12.2 2 learExposures	
11.12.23etNewWindow	
11.12.2\setCursor	
11.12.25changeCursor	
11.12.26 handle Motion Event	
11.12.27nitCursorState	
11.12.28nitCursorStates	
11.12.29makeBusyCursor	
11.12.30makeBusyCursors	
11.12.3HyperDocErrorHandler	
11.12.32etErrorHandlers	
11.13Line Extent Computation	. 282
11.13.1 computeInputExtent	
11.13.2 computePunctuationExtent	
11.13.3 computeWordExtent	
11.13.4 computeVerbatimExtent	
11.13.5 computeSpadsrctxtExtent	
11.13.6 computeDashExtent	
11.12.7 compute Toy t Extent	286

CONTENTS	101
----------	-----

$11.13.8compute Begin I tems Extent \dots \dots$	
11.13.9compute Item Extent 	293
$11.13.1 @ ompute Mitem Extent \\ \dots $	293
$11.13.1 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	
$11.13.12 ompute I f cond Extent \\ \dots \\ $	294
11.13.1& ompute Center Extent	295
11.13.14 omputeBfExtent	295
11.13.15computeEmExtent	296
11.13.1@omputeItExtent	296
11.13.17computeRmExtent	296
11.13.1&omputeButtonExtent	
11.13.1\(\text{andbuttonExtent} \\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
11.13.2@omputePastebuttonExtent	
11.13.2\partial ndpastebuttonExtent	
11.13.22 omputePasteExtent	
11.13.2&omputeSpadcommandExtent	
11.13.24 ompute Spadsrc Extent	
11.13.2\(\frac{1}{2}\) and Spadcommand Extent	
11.13.2@ndSpadsrcExtent	
11.13.27cmputeMboxExtent	
11.13.2&omputeBoxExtent	
11.13.2\@omputeIrExtent	
11.13.3@omputeImageExtent	
11.13.3tomputeTableExtent	
11.13.32 ompute Title Extent	
11.13.3&omputeHeaderExtent	
11.13.3&omputeFooterExtent	
11.13.3\(\frac{1}{2}\)computeScrollingExtent	
11.13.36 tart Newline	
11.13.37enterNodes	
11.13.3\(\partial\) unctuation Width	
11.13.39nputStringWidth	
11.13.40wordWidth	
11.13.4\textbatimWidth	
11.13.42widthOfDash	
11.13.4 3 extWidth	
11.13.44otalWidth	
11.13.45nitExtents	
11.13.46nitTitleExtents	316
11.13.47nitText	316
11.13.48extHeight	316
11.13.49extHeight1	317
11.13.50maxX	319
11.13.5 X value	320
11.13.52 railing Space	
11.13.53nsertBitmapFile	
-	

11.13.54nsertPixmapFile	323
11.13.55plh	324
11.14Handling forms	324
11.14.1 computeFormPage	324
11.14.2 windowWidth	324
11.14.3 windowHeight	325
11.14.4 formHeaderExtent	325
11.14.5 formFooterExtent	325
11.14.6 formScrollingExtent	326
11.15Managing the HyperDoc group stack	326
11.15.1 popGroupStack	326
11.15.2 pushGroupStack	327
11.15.3 initGroupStack	327
11.15.4 emTopGroup	328
11.15.5 rmTopGroup	328
11.15.6 lineTopGroup	328
11.15.7 bfTopGroup	328
11.15.8 ttTopGroup	329
11.15.9 pushActiveGroup	
11.15.1 Dough Spad Group	329
11.15.1 i nitTopGroup	
11.15.12enterTopGroup	
11.15.1&opyGroupStack	330
11.15.14reeGroupStack	
11.16Handle input, output, and Axiom communication	
11.16.1 makeRecord	
11.16.2 verifyRecord	
11.16.3 ht2Input	
11.16.4 makeInputFileName	
11.16.5 makePasteFileName	
11.16.6 makeTheInputFile	
11.16.7 makeInputFileFromPage	
11.16.8 strCopy	
11.16.9 inListAndNewer	
11.16.10makeInputFileList	
11.16.1\printPasteLine	
11.16.1 2 etSpadOutput	
11.16.1&etGraphOutput	
11.16.1&endCommand	
11.16.15printPaste	339
11.16.16printGraphPaste	340
11.17X Window window initialization code	341
11.17.1 initializeWindowSystem	341
11.17.2 initTopWindow	-
11.17.3 openFormWindow	
11.17.4 initFormWindow	344

CONTENTS	103
----------	-----

$11.17.5 \operatorname{setNameAndIcon}$											345
11.17.6 getBorderProperties											345
11.17.7 openWindow											346
11.17.8 setSizeHints											
11.17.9 getGCs											
11.17.1 0 oadFont											
11.17.11ngItColorsAndFonts											
11.17.12 hange Text											
11.17.13etColor											
11.17.14mergeDatabases											
11.17.15sIt850											
11.18Handling user page interaction											
11.18.1 fillBox											
11.18.2 toggleInputBox											
11.18.3 toggleRadioBox											
$11.18.4 \text{clearRbs} \dots \dots$											
11.18.5 changeInputFocus											
11.18.6 nextInputFocus											
11.18.7 prevInputFocus											
11.18.8 returnItem											
11.18.9 deleteItem											
11.19Manipulate the item stack											
11.19.1 pushItemStack											
11.19.2 clearItemStack											
$11.19.3 \text{popItemStack} \dots \dots$											
11.19.4 copyItemStack											
11.19.5 freeItemStack											
11.20Keyboard handling											
$11.20.1 \text{handleKey} \dots \dots \dots$											362
11.20.2 getModifierMask											365
11.20.3 initKeyin											366
11.21Handle page macros											366
$11.21.1 \operatorname{scanHyperDoc}$											366
11.21.2 number											367
$11.21.3 load Macro \dots \dots$											368
11.21.4 initParameterElem											369
11.21.5 pushParameters											
11.21.6 popParameters											370
11.21.7 parseMacro											370
11.21.8 getParameterStrings											371
11.21.9 parseParameters											373
11.22Memory management routines											373
11.22.1 freeIfNonNULL											373
11.22.2 allocHdWindow											373
11.22.3 freeHdWindow											374
11.22.4 allocNode											
11.44.4 anounde											$\sigma \cdot \sigma$

11.22.5 freeNode	375
11.22.6 allocIfnode	379
11.22.7 allocCondnode	379
11.22.8 freeCond	379
11.22.9 allocPage	379
11.22.16reePage	380
11.22.1freePaste	381
11.22.12 ree Pastebutton	
11.22.1 3 reePastearea	382
11.22.14reeString	
11.22.15reeDepend	
11.22.16dontFree	
11.22.17reeLines	
11.22.1 % reeInputItem	
11.22.19reeInputList	
11.22.2 6 reeInputBox	
11.22.2freeRadioBoxes	
11.22.2 2 llocInputline	
11.22.23allocPasteNode	
11.22.24llocPatchstore	
11.22.25reePatch	
11.22.26dlocInputbox	
11.22.27allocRbs	
11.22.2&llocButtonList	
11.22.29 ree Button List	
11.22.3\tesizeBuffer	
11.23Page parsing routines	
11.23.1 PushMR	
11.23.2 PopMR	
11.23.3 loadPage	
11.23.4 displayPage	
11.23.5 formatPage	
11.23.6 parseFromString	
11.23.7 parseTitle	
11.23.8 parseHeader	
11.23.9 initParsePage	
	392
	393
1 0	393 393
	399
	100
	100 101
<u> </u>	101 101
· · · · · · · · · · · · · · · · · · ·	102
	403 403
11.25.13vingoweduat	£U.Ó

CONTENTS	105

11.23.20windowCode
11.23.21windowId
11.23.2 2 eadHtDb
11.23.23readHtFile
11.23.24nakeLinkWindow
11.23.25makePasteWindow
11.23.26makeSpecialPage
11.23.27main
11.23.2&ddDependencies
11.23.2 9 sNumber
11.23.3\parserError
11.23.3getFilename
11.23.32etInputString
11.23.3getWhere
11.23.34indFp
11.24Handle InputString, SimpleBox, RadioBox input
11.24.1 makeInputWindow
11.24.2 makeBoxWindow
11.24.3 initializeDefault
11.24.4 parseInputstring
11.24.5 parseSimplebox
11.24.6 parseRadiobox
11.24.7 addBoxToRbList
11.24.8 checkOthers
11.24.9 insertItem
11.24.10nitPasteItem
11.24.1 tepasteItem
11.24.11cpasteticm
11.24.12 directives 11.24.13 dready There
11.24.1 parseRadioboxes
11.25Routines for paste-in areas
11.25.1 parsePaste
11.25.1 parser aste
11.25.3 parsePatch
11.25.4 loadPatch
11.26 parsing routines for node types
11.26.1 parseIfcond
1112012 parso contano de 11111111111111111111111111111111111
11.26.3 parseHasreturnto
11.26.4 parseNewcond
11.26.5 parseSetcond
11.26.6 parseBeginItems
11.26.7 parseItem
11.26.8 parseMitem
11.26.9 parseVerbatim
11.26.1\parseInputPix

11.26.1 parseCenterline	138
11.26.12parseCommand	
11.26.1\$\text{parseButton} \cdot \cd	
11.26.1 parseSpadcommand	
11.26.15parseSpadsrc	
11.26.16parseEnv	
11.26.17parseValue1	
11.26.1\$\text{parseValue2} \cdot \cd	142
11.26.1\$parseTable	143
11.26.2@arseBox	144
11.26.2 parseMbox	144
11.26.2\$\text{parseFree} \cdot	145
11.26.2\$parseHelp	145
11.27Reading bitmaps	146
11.27.1 HTReadBitmapFile	146
11.27.2 readHot	148
11.27.3 readWandH	148
11.27.4 insertImageStruct	149
11.28Scrollbar handling routines	149
11.28.1 makeScrollBarWindows	
11.28.2 drawScroller3DEffects	151
11.28.3 showScrollBars	
11.28.4 moveScroller	153
11.28.5 drawScrollLines	
11.28.6 calculateScrollBarMeasures	
11.28.7 linkScrollBars	
11.28.8 scrollUp	
11.28.9 scrollUpPage	
11.28.19crollToFirstPage	
11.28.1\text{kcrollDown}	
11.28.1 2 crollDownPage	
11.28.1 3 crollScroller	
11.28.14ideScrollBars	
11.28.15getScrollBarMinimumSize	
11.28.16h	
11.28.17changeWindowBackgroundPixmap	
11.29Display text object	
	160
	165
	166
	166
	167
	167
	168
	168
<u> </u>	170

CONTENTS	10'

	11.30.1 issueSpadcommand	70
	11.30.2 sendPile	70
	11.30.3 issueDependentCommands	71
	11.30.4 mark As Executed	72
	11.30.5 startUserBuffer	72
	11.30.6 clear Execution Marks	73
	11.30.7 acceptMenuConnection	74
	11.30.8 acceptMenuServerConnection	74
	11.30.9 printToString	
	11.30.1\psirintToString1	
	11.30.11ssueServerCommand	
	11.30.1 2 ssueServerpaste	81
	11.30.1 3 ssueUnixcommand	
	11.30.14ssueUnixlink	
	11.30.15ssueUnixpaste	
	11.30.16 ervice Session Socket	83
	11.30.17 witch Frames	
	11.30.18endLispCommand	
	11.30.1\(\text{\text{9}}\) scapeString	
	11.30.2@inescapeString	84
	11.30.2t-loseClient	
	11.30.22\(\text{printSourceToString}\)	
	11.30.23printSourceToString1	86
11.	31Produce titlebar	93
	11.31.1 makeTitleBarWindows	93
	11.31.2 show Title Bar	94
	11.31.3 linkTitleBarWindows	95
	11.31.4 readTitleBarImages	96
	11.31.5 getTitleBarMinimumSize	96
	11.31.6 main	
12 Th	e htsearch script 49) 9
13 Tł	te presea script 50)1
	1 token.h	02
14 Th	e Bitmaps 50)7
14.	1 ht_icon	07
14.	2 exit.bitmap	07
14.	3 help2.bitmap	08
14.	4 return3.bitmap	09
14.	5 up3.bitmap	09
	6 noop.bitmap	10
	7 exit3d.bitmap	11
14.	8 help3d.bitmap	11
14.	9 home3d.bitmap	12

14.10up3d.bitmap .																		512
14.11noop3d.bitmap																		513

Volume 7.1: Axiom Hyperdoc

1	Intr	oducti		1
	1.1	Setting	g up the Hyperdoc fonts and colors	1
2	Rele	ease N		3
	2.1	release	enotes.ht	3
		2.1.1	What is new in Axiom	3
		2.1.2	Online Information	
		2.1.3	August 2014 Release Notes	6
		2.1.4	· ·	15
		2.1.5	March 2012 Release Notes	17
		2.1.6	January 2012 Release Notes	19
		2.1.7	November 2011 Release Notes	22
		2.1.8	September 2011 Release Notes	25
		2.1.9	July 2011 Release Notes	27
		2.1.10	May 2011 Release Notes	28
		2.1.11	March 2011 Release Notes	31
		2.1.12	January 2011 Release Notes	33
		2.1.13	November 2010 Release Notes	35
		2.1.14	September 2010 Release Notes	37
		2.1.15	July 2010 Release Notes	40
		2.1.16	May 2010 Release Notes	43
		2.1.17	March 2010 Release Notes	47
		2.1.18	January 2010 Release Notes	50
				52
			September 2009 Release Notes	54
				56
				58
			v	63
				68
			·	73
			September 23, 2008 Release Notes	74
			- · · · · · · · · · · · · · · · · · · ·	78
				81
				82
				85
			v .	90
			Feature Complete Release Feb 2005	94
3	Spe	cial hy	perdoc pages	97
	3.1			97
		3.1.1		97
		3.1.2	Special hooks to Unix	97
		3.1.3	HyperDoc menu macros	98

		3.1.4	Bitmaps and bitmap manipulation macros	9
		3.1.5	HyperDoc button objects	9
		3.1.6	Standard HyperDoc button configurations	0
		3.1.7	HyperDoc graphics macros	
		3.1.8	TeX and LaTeX compatibility macros	
		3.1.9	Book and .ht page macros	
		00	Browse macros	
			Support for output and graph paste-ins	
			Hook for including a local menu item on the rootpage	
			Not Connected to Axiom	
			Do You Really Want to Exit?	
			Missing Page	
			Something is Wrong	
		3.1.17	Sorry!	3
4	Нур	erdoc	pages 109	9
	4.1	rootpa	ge.ht	9
		4.1.1	Axiom HyperDoc Top Level	9
		4.1.2	Axiom – The Scientific Computation System	
		4.1.3	System Commands	
		4.1.4	Axiom Examples	
		4.1.5	Axiom Reference	
		4.1.6	NAG Documentation	
	4.2	algebra	ı.ht	
		4.2.1	Abstract Algebra	
		4.2.2	Number Theory	
	4.3			
	1.0	4.3.1	AssociationList	
	4.4	array1.		
	4.4		OneDimensionalArray	
	4.5		ht	
	4.5	4.5.1		
	16	-	TwoDimensionalArray	
	4.6		t	
		4.6.1	Basic Commands	
	4 7	4.6.2	Calculus	
	4.7		ht	
	4.0		BalancedBinaryTree	
	4.8		ht	
		4.8.1	Binary Expansion	
	4.9		ht	-
		4.9.1	Bit Map Catalog	-
	4.10	bop.ht		
			BasicOperator	1
	4.11		ht	_
		4.11.1	BinarySearchTree)
	1 19	card ht	176	c

	4.12.1 CardinalNumber	176
4.13	carten.ht	186
	4.13.1 CartesianTensor	186
4.14	cclass.ht	
	4.14.1 CharacterClass	
4.15	char.ht	
	4.15.1 Character	
	4.15.2 CliffordAlgebra	
	4.15.3 The Complex Numbers as a Clifford Algebra	
	4.15.4 The Quaternion Numbers as a Clifford Algebra	
	4.15.5 The Exterior Algebra on a Three Space	
	4.15.6 The Dirac Spin Algebra	
4 16	complex.ht	
4.10	4.16.1 Complex	
4 17	contfrac.ht	
4.17		
4.10	4.17.1 ContinuedFraction	
4.18	cphelp.ht	
4.10	4.18.1 Control Panel Bits	
4.19	cycles.ht	
	4.19.1 CycleIndicators	
4.20	coverex.ht	
	4.20.1 Examples Of Axiom Commands	
	4.20.2 Differentiation	
	4.20.3 Integration	
	4.20.4 Laplace Transforms	
	4.20.5 Limits	
	4.20.6 Matrices	
	4.20.7 2-D Graphics	322
	4.20.8 3-D Graphics	324
	4.20.9 Series	326
	4.20.10 Summations	331
4.21	${\it decimal.ht} \ \ldots \ldots$	337
	4.21.1 Decimal Expansion	337
4.22	derham.ht	341
	4.22.1 DeRhamComplex	341
4.23	dfloat.ht	
	4.23.1 DoubleFloat	357
4.24	dmp.ht	
	4.24.1 DistributedMultivariatePoly	
4.25	eq.ht	368
	4.25.1 Equation	368
4.26	eqtbl.ht	374
0	4.26.1 EqTable	374
4.27	evalex.ht	377
	4.27.1 Example of Standard Evaluation	377
	4.27.2 Example of Standard Evaluation	

4.28 exdiff.ht	. 380
4.28.1 Computing Derivatives	. 380
4.28.2 Derivatives of Functions of Several Variables	. 381
4.28.3 Derivatives of Higher Order	
4.28.4 Multiple Derivatives I	
4.28.5 Multiple Derivatives II	
4.28.6 Derivatives of Functions Involving Formal Integrals	
4.28.7 Exit	
4.29 exlap.ht	
4.29.1 Laplace transform with a single pole	
4.29.2 Laplace transform of a trigonometric function	
4.29.3 Laplace transform requiring a definite integration	
4.29.4 Laplace transform of exponentials	
4.29.5 Laplace transform of an exponential integral	
4.29.6 Laplace transform of special functions	
4.30 exint.ht	
4.30.1 Integral of a Rational Function	
4.30.2 Integral of a Rational Function with a Real Parameter	
4.30.3 Integral of a Rational Function with a Complex Parameter	
4.30.4 Two Similar Integrands Producing Very Different Results	
4.30.5 An Integral Which Does Not Exist	
4.30.6 A Trigonometric Function of a Quadratic	
4.30.7 Integrating a Function with a Hidden Algebraic Relation	
4.30.8 Details for integrating a function with a Hidden Algebraic Relation .	
4.30.9 An Integral Involving a Root of a Transcendental Function	
4.30.10 An Integral of a Non-elementary Function	
4.31 exlimit.ht	
4.31.1 Computing Limits	
4.31.2 Limits of Functions with Parameters	
4.31.3 One-sided Limits	
4.31.4 Two-sided Limits	
4.31.5 Limits at Infinity	
4.31.6 Real Limits vs. Complex Limits	
4.31.7 Complex Limits at Infinity	
4.32 exmatrix.ht	
4.32.1 Basic Arithmetic Operations on Matrices	
4.32.2 Constructing new Matrices	
4.32.3 Trace of a Matrix	
4.32.4 Determinant of a Matrix	
4.32.5 Inverse of a Matrix	
4.32.6 Rank of a Matrix	
4.33 expr.ht	
4.33.1 Expression	
4.34 explot2d.ht	
4.34.1 Plotting Functions of One Variable	
4.34.2 Plotting Parametric Curves	446

	4.34.3 Plotting Using Polar Coordinates	. 447
	4.34.4 Plotting Plane Algebraic Curves	. 448
4.35	explot3d.ht	
	4.35.1 Plotting Functions of Two Variables	
	4.35.2 Plotting Parametric Surfaces	
	4.35.3 Plotting Parametric Curves	
4 36	expose.ht	
1.00	4.36.1 Exposure	
	4.36.2 System Defined Exposure Groups	
	4.36.3 What is an Exposure Group?	
	4.36.4 Details on Exposure	
1 27	exseries.ht	
4.57	4.37.1 Converting Expressions to Series	
	4.37.1 Converting Expressions to Series	
	4.37.3 Functions on Power Series	
4.00	4.37.4 Substituting Numerical Values in Power Series	
4.38	exsum.ht	
	4.38.1 Summing the Entries of a List I	
	4.38.2 Summing the Entries of a List II	
	4.38.3 Approximating e	
	4.38.4 Closed Form Summations	
	4.38.5 Sums of Cubes	
	4.38.6 Sums of Polynomials	
	4.38.7 Sums of General Functions	
	4.38.8 Infinite Sums	. 470
4.39	$farray.ht \ \dots $. 472
	4.39.1 FlexibleArray	. 472
4.40	file.ht	. 480
	4.40.1 File	. 480
4.41	float.ht	. 487
	4.41.1 Float	. 487
	4.41.2 Introduction to Float	. 488
	4.41.3 Conversion Functions	
	4.41.4 Output Functions	
	4.41.5 An Example: Determinant of a Hilbert Matrix	
4.42	fname.ht	
	4.42.1 FileName	
4.43	fr.ht	
1,10	4.43.1 Factored	
	4.43.2 Decomposing Factored Objects	
	4.43.3 Expanding Factored Objects	
	4.43.4 Arithmetic with Factored Objects	
	4.43.5 Creating New Factored Objects	
	4.43.6 Factored Objects with Variables	
1 11	fr2.ht	
4.44		
	4.44.1 FactoredFunctions2	. ააყ

4.45	frac.ht
	4.45.1 Fraction
4.46	fparfrac.ht
	$4.46.1 \ \ Full Partial Frac Expansion \ \ . \ . \ . \ . \ . \ . \ . \ . \ . $
4.47	function.ht
	4.47.1 Functions in Axiom
	4.47.2 Rational Functions
	4.47.3 Algebraic Functions
	4.47.4 Elementary Functions
	4.47.5 Simplification
4.48	gbf.ht
	4.48.1 GroebnerFactorizationPkg
4.49	gloss.ht
	4.49.1 Glossary
4.50	graphics.ht
	4.50.1 Graphics
	4.50.2 Graphics Examples
	4.50.3 Assorted Graphics Examples
	4.50.4 Three Dimensional Graphics
	4.50.5 Functions of One Variable
	4.50.6 Parametric Curves
	4.50.7 Polar Coordinates
	4.50.8 Implicit Curves
	4.50.9 Lists of Points
	4.50.10 Three Dimensional Graphing
	4.50.11 Functions of Two Variables
	4.50.12 Parametric Space Curves
	4.50.13 Parametric Tube Plots
	4.50.14 Parametric Surfaces
	4.50.15 Building 3D Objects
	4.50.16 Two Dimensional Graphics
	4.50.17 Functions of One Variable
	4.50.18 Parametric Curves
	4.50.19 Polar Coordinates
	4.50.20 Implicit Curves
	4.50.21 Lists of Points
	4.50.22 Stand-alone Viewport
4.51	grpthry.ht
	4.51.1 Group Theory
	4.51.2 Representations of A_6 A6
	4.51.3 Representation Theory
	4.51.4 Group Theory
4.52	gstbl.ht
	4.52.1 GeneralSparseTable
4.53	heap.ht
	4.53.1. Hoap. 701

4.54	hexadec.ht	
	4.54.1 HexadecimalExpansion	703
4.55	int.ht	707
	4.55.1 Integer	
	4.55.2 Basic Functions	
	4.55.3 Primes and Factorization	
	4.55.4 Some Number Theoretic Functions	
4.56	intheory.ht	
	4.56.1 IntegerNumberTheoryFunctions	
4 57	kafile.ht	
1.01	4.57.1 KeyedAccessFile	
4 58	kernel.ht	
1.00	4.58.1 Kernel	
4 59	lazm3pk.ht	
1.00	4.59.1 LazardSetSolvingPackage	
4.60	lexp.ht	
4.00	4.60.1 LieExponentials	
4.61	lextripk.ht	
4.01	4.61.1 LexTriangularPackage	
4.69	lib.ht	
4.02	4.62.1 Library	
4 69	link.ht	
4.05	4.63.1 The Axiom Link to NAG Software	
	4.63.2 Use of the Link from HyperDoc	
	4.63.3 C02 Zeros of Polynomials	
	4.63.4 C05 Roots of One or More Transcendental Equations	
	4.63.5 C06 Summation of Series	
	4.63.6 D01 Quadrature	
	4.63.7 D02 Ordinary Differential Equations	
	4.63.8 D03 Partial Differential Equations	
	4.63.9 E01 Interpolation	
	4.63.10 E02 Curve and Surface Fitting	
	4.63.11 E04 Minimizing or Maximizing a Function	
	4.63.12 F01 Matrix Operations - Including Inversion	
	4.63.13 F02 Eigenvalues and Eigenvectors	
	4.63.14 F04 Simultaneous Linear Equations	
	4.63.15 F07 Linear Equations (LAPACK)	
	4.63.16 S – Approximations of Special Functions	
4.64	list.ht	
	4.64.1 List	
	4.64.2 Creating Lists	
	4.64.3 Accessing List Elements	
	4.64.4 Changing List Elements	
	4.64.5 Other Functions	
	4.64.6 Dot, Dot	896
4.65	lodo.ht	898

	4.65.1 LinearOrdinaryDifferentialOperator	898
	4.65.2 Differential Operators with Series Coefficients	899
4.66	$lodo 1.ht \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	909
	4.66.1 LinearOrdinaryDifferentialOperator1	909
	4.66.2 Differential Operators with Rational Function Coefficients	910
4.67	lodo2.ht	920
	4.67.1 LinearOrdinaryDifferentialOperator2	920
	4.67.2 Differential Operators with Constant Coefficients	922
	4.67.3 Differential Operators with Matrix Coefficients Operating on Vectors .	928
4.68	lpoly.ht	936
	4.68.1 LiePolynomial	936
4.69	lword.ht	
	4.69.1 LyndonWord	
4.70	magma.ht	
20	4.70.1 Magma	
4 71	man0.ht	
1.11	4.71.1 Reference Search	
	4.71.2 Lisp Functions	
	4.71.3 Axiom Browser	
	4.71.4 The Hyperdoc Browse Facility	
1 72	mapping.ht	
4.12	4.72.1 Domain Mapping(T,S,)	
	4.72.2 Domain Constructor Mapping	
1 72	mappkg1.ht	
4.75	4.73.1 MappingPackage1	
171		
4.74	mset.ht	
4 75	4.74.1 MultiSet	
4.75	matrix.ht	
	4.75.1 Matrix	
	4.75.2 Creating Matrices	
4 70	4.75.3 Operations on Matrices	
4.70	mkfunc.ht	
. ==	4.76.1 MakeFunction	
4.77	mpoly.ht	
	4.77.1 MultivariatePolynomial	
4.78	newuser.ht	
	4.78.1 No More Help :-(
	4.78.2 You Tried It!	1033
4.79	none.ht	1034
	4.79.1 None	1034
4.80	numbers.ht	1036
	4.80.1 Axiom Number Types	1036
	4.80.2 Fraction	1038
	4.80.3 Rational Number	1040
	4.80.4 Integers	1043
	4.80.5 Integer Examples	1048

	4.80.6 Integer Example Proof		 	1050
	4.80.7 Integer Problems		 	1051
	4.80.8 Integer Problem Proof			
	4.80.9 Solution to Problem #1			
	4.80.10 Solution to Problem #2			
4.81	oct.ht			
	4.81.1 Octonion			
4.82	odpol.ht			
	4.82.1 OrderlyDifferentialPolynomial			
4 83	op.ht			
1.00	4.83.1 Operator			
4 84	ovar.ht			
1.01	4.84.1 OrderedVariableList			
4 85	perman.ht			
1.00	4.85.1 Permanent			
4.86	pfr.ht			
4.00	4.86.1 PartialFraction			
1.87	poly.ht			
4.01	4.87.1 Polynomials			
	4.87.2 The Specific Polynomial Types			
	4.87.3 Basic Operations On Polynomials			
	4.87.4 Polynomial Evaluation and Substitution			
	4.87.5 Greatest Common Divisors, Resultants, and Discriminants			
	4.87.6 Roots of Polynomials			
1 00	poly1.ht			
4.00	4.88.1 Polynomial			
4.80	quat.ht			
4.03	4.89.1 Quaternion			
4.00	radix.ht			
4.90	4.90.1 RadixExpansion			
4.01	reclos.ht			
4.91	4.91.1 RealClosure			
4.02	record.ht			
4.92	4.92.1 Domain Record(a:A,,b:B)			
	4.92.2 Domain Constructor Record			
4.02	regset.ht			
4.95	9			
4.04	4.93.1 RegularTriangularSet			
4.94				
4.05	4.94.1 RomanNumeral			
4.90	seg.ht			
1 00				
4.90	segbind.ht			
4.07	4.96.1 SegmentBinding			
4.97	set.ht			
4.00	4.97.1 Set			
4.98	sint.ht		 	-1245

4.98.1 SingleInteger	
4.99 sqmatrix.ht	
4.99.1 SquareMatrix	
4.100sregset.ht	
4.100.1 SquareFreeRegularTriangularSet	1255
4.101stbl.ht	267
4.101.1 SparseTable	
4.102stream.ht	271
4.102.1 Stream	271
4.103string.ht	
4.103.1 String	
4.104strtbl.ht	
4.104.1 StringTable	
4.105symbol.ht	
4.105.1 Symbol	
4.106table.ht	
4.106.1 Table	
4.107textfile.ht	
4.107.textfile	
4.107.1 Textrine	
•	
4.108.1 Axiom Topics	
4.108.2 Solving Equations	
4.108.3 Linear Algebra	
4.108.4 Calculus	
4.109type.ht	
4.109.1 Category Type	
4.110union.ht	
4.110.1 Domain Union(a:A,,b:B)	
4.110.2 Domain Constructor Union	
$4.110.3 \text{Domain Union}(A,,B) \dots \dots$	
4.110.4 Domain Constructor Union	
4.111uniseg.ht	
4.111.1 UniversalSegment	
4.112up.ht	
4.112.1 UnivariatePolynomial	1333
4.113oreup.ht	
4.113.1 UnivariateSkewPolynomial	1350
4.114vector.ht	1357
4.114.1 Vector	1357
4.115void.ht	1363
4.115.1 Void	1363
	1366
	1366
ů – – – – – – – – – – – – – – – – – – –	1374
· ·	1374
-	1379
I I V	

CONTENTS	119	

		XPBWPolynomial
		nt
	4.119.1	l XPolynomial
		1408
	4.120.1	l XPolynomialRing
	4.121zdsolve	e.ht
	4.121.1	l ZeroDimensionalSolvePackage
	4.122zlinder	p.ht
	4.122.1	IntegerLinearDependence
5	Users Gui	de Pages (ug.ht) 1471
	5.0.2	Users Guide
6	Users Gui	de Chapter 0 (ug00.ht) 1475
	6.0.3	What's New for May 2008
	6.0.4	New polynomial domains and algorithms
	6.0.5	Enhancements to HyperDoc and Graphics
	6.0.6	Enhancements to NAGLink
	6.0.7	Enhancements to the Lisp system
_		- •
7		de Chapter 1 (ug01.ht) 1485
	7.0.8	An Overview of Axiom
	7.0.9	Starting Up and Winding Down
		Clef
		Typographic Conventions
		The Axiom Language
		Arithmetic Expressions
		Previous Results
		Some Types
		Symbols, Variables, Assignments, and Declarations
		Conversion
		Calling Functions
		Some Predefined Macros
	7.0.20	Long Lines
	7.0.21	Comments
		Graphics
	7.0.23	Numbers
	7.0.24	Data Structures
	7.0.25	Expanding to Higher Dimensions
	7.0.26	Writing Your Own Functions
	7.0.27	Polynomials
	7.0.28	Limits
	7.0.29	Series
	7.0.30	Derivatives
		Integration
		Differential Equations
		•

	7.0.33	Solution of Equations	L(
	7.0.34	System Commands	LE
8	Users Gui	de Chapter 2 (ug02.ht) 1623	3
		Using Types and Modes	23
		The Basic Idea	
		Domain Constructors	
		Writing Types and Modes	
		Types with No Arguments	
		Types with One Argument	
		Types with More Than One Argument	
		Modes	
	8.0.43	Abbreviations	51
	8.0.44	Declarations	54
		Records	
		Unions	
		Unions Without Selectors	
		Unions With Selectors	
		The "Any" Domain	
		Conversion	
	8.0.51	Subdomains Again):
		Package Calling and Target Types	
	8.0.53	Resolving Types)6
	8.0.54	Exposing Domains and Packages	13
	8.0.55	Commands for Snooping	17
•	TT 0 '	1 (1) (0 (0 1))	
9		de Chapter 3 (ug03.ht) 1723	
		Using Hyperdoc	
		Headings	
		Key Definitions	
		Scroll Bars	
		Input Areas	
		Radio Buttons and Toggles	
		Logical Searches	
		Example Pages	
	9.0.00	X Window Resources for Hyperdoc);
10	Users Gui	de Chapter 4 (ug04.ht) 1741	L
	10.0.66	SInput Files and Output Styles	
		7 Input Files	
		8 The .axiom.input File	
		OCommon Features of Using Output Formats	
		Monospace 2D Mathematical Format	
		1 TeX Format	
	10.0.79	2 IBM Script Formula Format 17:	5.5

CONTENTS	121

10.0.73 FORTRAN Format	. 1756
10.0.74 HTML Format	. 1765
10.0.75 MathML Format	. 1766
	4 - 0 -
11 Users Guide Chapter 5 (ug05.ht)	1767
11.0.76 Introduction to the Axiom Interactive Language	
11.0.77 Immediate and Delayed Assignments	
11.0.78 Blocks	
11.0.79 if-then-else	
11.0.80 Loops	
11.0.81 Compiling vs. Interpreting Loops	
11.0.82 return in Loops	
11.0.83 break in Loops	
11.0.84 break vs. => in Loop Bodies	
11.0.85 More Examples of break	
11.0.86 iterate in Loops	
11.0.87 while Loops	. 1811
11.0.88 for Loops	. 1818
11.0.89 for i in nm repeat	. 1819
11.0.90 for i in nm by s repeat	. 1823
11.0.91 for i in n repeat	. 1825
11.0.92 for x in l repeat	. 1827
11.0.93 "Such that" Predicates	. 1830
11.0.94 Parallel Iteration	
11.0.95 Creating Lists and Streams with Iterators	. 1838
11.0.96 An Example: Streams of Primes	. 1845
19 H C	1059
12 Users Guide Chapter 6 (ug06.ht)	1853
12.0.97 User-Defined Functions, Macros and Rules	
12.0.98 Functions vs. Macros	
12.0.99 Macros	
12.0.10 0 introduction to Functions	
12.0.10 Declaring the Type of Functions	
12.0.1020 ne-Line Functions	
12.0.10 Declared vs. Undeclared Functions	
12.0.10 Functions vs. Operations	
12.0.10 Delayed Assignments vs. Functions with No Arguments	
12.0.106 How Axiom Determines What Function to Use	
12.0.10 Compiling vs. Interpreting	
12.0.10\Piece-Wise Function Definitions	
12.0.109A Basic Example	
12.0.11 Picking Up the Pieces	
12.0.11Predicates	
12.0.112 Caching Previously Computed Results	
12.0.11Recurrence Relations	
12.0.114 Making Functions from Objects	. 1924

12.0.11 Functions Defined with Blocks	1933
12.0.116Free and Local Variables	
12.0.11\(\text{Anonymous Functions} \) \(
12.0.11 S ome Examples	
12.0.11 Declaring Anonymous Functions	
12.0.120Example: A Database	
12.0.12 Example: A Famous Triangle	
12.0.12 Example: Testing for Palindromes	
12.0.12 Rules and Pattern Matching	
13 Users Guide Chapter 7 (ug07.ht)	2003
13.0.12 Graphics	
13.0.125 Two-Dimensional Graphics	
13.0.12@Plotting Two-Dimensional Functions of One Variable	
13.0.12Plotting 2D Parametric Plane Curves	
13.0.12 Plotting Plane Algebraic Curves	
13.0.129 Two-Dimensional Options	
13.0.13Color	
13.0.13 Palette	
13.0.132Two-Dimensional Control-Panel	
13.0.13 Operations for Two-Dimensional Graphics	
13.0.134Addendum: Building Two-Dimensional Graphs	
13.0.135Addendum: Appending a Graph to a Viewport Window Containing a	
Graph	2053
13.0.136 Three-Dimensional Graphics	2056
13.0.13Plotting Three-Dimensional Functions of Two Variables	2058
13.0.13 Plotting Three-Dimensional Parametric Space Curves	2061
13.0.13 Plotting 3D Parametric Surfaces	2064
13.0.14 Three-Dimensional Options	2068
13.0.14 The make Object Command	2078
13.0.14 Building 3D Objects From Primitives	2081
13.0.14 Coordinate System Transformations	2093
13.0.144Three-Dimensional Clipping	2100
13.0.145 Three-Dimensional Control-Panel	2102
13.0.14 © perations for Three-Dimensional Graphics	2108
13.0.14 Customization using .Xdefaults	2114
14 Users Guide Chapter 8 (ug08.ht)	2117
14.0.148 dvanced Problem Solving	
14.0.149Numeric Functions	
14.0.15 Polynomial Factorization	
14.0.15 Integer and Rational Number Coefficients	
14.0.15 F inite Field Coefficients	
14.0.15 Simple Algebraic Extension Field Coefficients	
14.0.15 Factoring Rational Functions	
14.0.155 Manipulating Symbolic Roots of a Polynomial	

14.0.15 Using a Single Root of a Polynomial			
14.0.157Using All Roots of a Polynomial			
14.0.15 Computation of Eigenvalues and Eigenvectors			
14.0.15 Solution of Linear and Polynomial Equations	 	 	2171
14.0.16 Solution of Systems of Linear Equations	 	 	2172
14.0.16 Solution of a Single Polynomial Equation	 	 	2176
14.0.16 Solution of Systems of Polynomial Equations	 	 	2181
14.0.16 3 imits	 	 	2186
14.0.164aplace Transforms	 	 	2194
14.0.16 5 ntegration	 	 	2198
14.0.16 Working with Power Series			
14.0.16 Creation of Power Series			
14.0.16 Coefficients of Power Series	 	 	2214
14.0.16Power Series Arithmetic	 	 	 2217
14.0.17 Functions on Power Series	 	 	2221
14.0.17 Converting to Power Series	 	 	2229
14.0.17 Power Series from Formulas	 	 	2237
14.0.17 Substituting Numerical Values in Power Series	 	 	2243
14.0.17 Example: Bernoulli Polynomials and Sums of Powers .	 	 	2245
14.0.17 Solution of Differential Equations	 	 	2254
14.0.17 Closed-Form Solutions of Linear Differential Equations	 	 	2255
14.0.17 Closed-Form Solutions of Non-Linear DEs	 	 	2263
14.0.17 Power Series Solutions of Differential Equations	 	 	2273
14.0.17 F inite Fields	 	 	2278
14.0.18 Modular Arithmetic and Prime Fields	 	 	2280
14.0.18 Extensions of Finite Fields	 	 	2289
14.0.182 rreducible Mod Polynomial Representations	 	 	2292
14.0.18 Cyclic Group Representations	 	 	2300
14.0.18 Normal Basis Representations	 	 	2307
14.0.18 Conversion Operations for Finite Fields	 	 	2314
14.0.18 (Utility Operations for Finite Fields	 	 	2322
14.0.18 P rimary Decomposition of Ideals	 	 	2338
14.0.18© computation of Galois Groups	 	 	2346
14.0.18 Non-Associative Algebras and Genetic Laws	 	 	2365
15 Users Guide Chapter 10 (ug10.ht)			377
15.0.19 Interactive Programming			
15.0.19 Drawing Ribbons Interactively			
15.0.192A Ribbon Program			
15.0.19Coloring and Positioning Ribbons			
15.0.19Points, Lines, and Curves			
15.0.195 Bouquet of Arrows			2396
15.0.19 © Drawing Complex Vector Fields			2398
15.0.19 Drawing Complex Functions			2403
15.0.19 Functions Producing Functions			2407
15.0.199Automatic Newton Iteration Formulas	 	 	2409

16 Users Guide Chapter 11 (ug11.ht)		419
16.0.20 P ackages		
16.0.20 Names, Abbreviations, and File Structure		2422
16.0.20 2 yntax		2424
16.0.203Abstract Datatypes		2426
16.0.20Capsules		2428
16.0.20 5 nput Files vs. Packages		2430
16.0.20 Compiling Packages		2431
16.0.20 P arameters		2435
16.0.20Conditionals		2438
16.0.20¶Testing		2441
16.0.210 How Packages Work		2448
17 Users Guide Chapter 12 (ug12.ht)	2	451
17.0.21 Categories		
17.0.21 Definitions		
17.0.21\(\mathbb{E}\)xports		
17.0.21Documentation		
17.0.21 Hierarchies		
17.0.216 Membership		
17.0.21 7 Defaults		
17.0.218Axioms		
17.0.21@correctness		
17.0.220Attributes		
17.0.22 Parameters		
17.0.22 C arameters		
17.0.222 Onditionals		
17.0.223 monymous Categories		2410
18 Users Guide Chapter 13 (ug13.ht)		479
18.0.224Domains		
18.0.22 Domains vs. Packages		
18.0.22 Definitions		
18.0.22 Category Assertions		
18.0.228 Demo		2487
18.0.22\Prowse		2491
18.0.23Representation		2493
18.0.23 Multiple Representations		2494
18.0.232Add Domain		2496
18.0.23 D efaults		2497
18.0.23 • Origins		2499
18.0.23 5 hort Forms		2501
18.0.236Example 1: Clifford Algebra		2502
18.0.23 Example 2: Building A Query Facility		2505
18.0.238 Little Query Language		2507
18.0.239The Database Constructor		2510
18 0 24 Query Equations		2513

125
Ľ

	18.0.24 DataLists	2515
	18.0.242 Index Cards	2517
	18.0.24 Creating a Database	2518
	18.0.24 Putting It All Together	
	18.0.24\(\overline{\pmathbb{E}}\) xample Queries	
10 User	rs Guide Chapter 14 (ug14.ht)	2533
	19.0.24@Browse	
	19.0.247The Front Page: Searching the Library	
	19.0.248The Constructor Page	
	19.0.24© constructor Page Buttons	
	19.0.25@Cross Reference	
	19.0.25 Views Of Constructors	
	19.0.25 Giving Parameters to Constructors	
	19.0.25 Miscellaneous Features of Browse	
	19.0.254The Description Page for Operations	
	19.0.255 Views of Operations	
	19.0.25 Capitalization Convention	2556
20 User	rs Guide Chapter 15 (ug15.ht)	2559
	20.0.25 What's New in Axiom Version 2.0	2559
	20.0.258mportant Things to Read First	2560
	20.0.259The NAG Library Link	
	20.0.26 Interpreting NAG Documentation	
	20.0.26 U sing the Link	
	20.0.26 P roviding values for Argument Subprograms	
	20.0.26 General Fortran-generation utilities in Axiom	
	20.0.26 Some technical information	
	20.0.265 Interactive Front-end and Language	
	20.0.26 Library	
	20.0.26 HyperDoc	
	20.0.26 Documentation	
	20.0.20 Documentation	2005
	(10)	2605
	21.0.269 Axiom System Commands	
	21.0.27 0 ntroduction	2608
	21.0.27) abbreviation	2610
	21.0.272boot	2612
	21.0.273cd	2614
	21.0.274close	2616
	21.0.275clear	2617
	21.0.276compile	
	21.0.277display	
	21.0.278edit	
	21.0.279fin	
	21.0.280frame	
	,	

	21.0.28) help			
	21.0.282 history	 	 	 . 2632
	21.0.283 library	 	 	 . 2636
	21.0.284 lisp	 	 	 . 2638
	21.0.285 load	 	 	 . 2639
	21.0.286ltrace	 	 	 . 2640
	21.0.287pquit	 	 	 . 2641
	21.0.28\(\frac{9}{2}\)quit	 	 	 . 2643
	21.0.289read	 	 	 . 2645
	21.0.290set	 	 	 . 2647
	21.0.29 how	 	 	 . 2649
	21.0.292 spool	 	 	 . 2651
	21.0.293synonym	 	 	 . 2652
	21.0.294system	 	 	 . 2654
	21.0.295trace	 	 	 . 2656
	21.0.29 gundo	 	 	 . 2662
	21.0.29 what	 	 	 . 2664
22 Use	rs Guide Chapter 21 (ug21.ht)			2667
	22.0.29Programs for Axiom Images			
	22.0.299mages1.input			
	22.0.300mages2.input			
	22.0.301mages3.input			
	22.0.302mages5.input			
	22.0.30 3 mages6.input			
	22.0.304mages7.input			
	22.0.305mages8.input			
	22.0.30@onformal.input			
	22.0.307knot.input			
	22.0.30 Satube.input			
	22.0.30 9dhtri.input			
	22.0.310 etra.input			
	22.0.31 antoine.input			
	22.0.312cherk.input	 	 	 . 2694
00 TT				200=
23 Hyp	pertex Language Pages			2697
00.1	23.0.31 Creating Hyperdoc Pages			
23.1	htxadvpage1.ht			
	23.1.1 Input Areas			
	23.1.2 HTXAdvPage1xPatch1 patch			
	23.1.3 HTXAdvPage1xPatch1A patch .			
	23.1.4 HTXAdvPage1xPatch2 patch			
00.0	23.1.5 HTXAdvPage1xPatch2A patch .			
23.2	htxadvpage2.ht			
00.0	23.2.1 Radio buttons			
23.3	htxadvpage3.ht	 	 	 . 2703

	23.3.1 Macros	2703
23.4	$htxadvpage 4.ht \ \dots $	2704
	23.4.1 Patch and Paste	2704
	23.4.2 patch1 patch	2707
	23.4.3 Patch1 patch	2707
	23.4.4 Patch2 patch	2708
23.5	htxadvpage5.ht	2708
	23.5.1 Axiom paste-ins	
23.6	htxadvpage6.ht	2710
	23.6.1 Miscellaneous	
	23.6.2 HTXAdvPage6xPatch1 patch	2712
	23.6.3 HTXAdvPage6xPatch1A patch	
	23.6.4 HTXAdvPage6xPatch2 patch	
	23.6.5 HTXAdvPage6xPatch2A patch	2713
	23.6.6 HTXAdvPage6xPatch3 patch	2713
	23.6.7 HTXAdvPage6xPatch3A patch	
23.7	htxadvtoppage.ht	
	23.7.1 Advanced features in Hyperdoc	2714
23.8	htxformatpage1.ht	2715
	23.8.1 Using the special characters	2715
	23.8.2 HTXFormatPage1xPatch1 patch	2716
	23.8.3 HTXFormatPage1xPatch2 patch	2716
23.9	htxformatpage2.ht	2717
	23.9.1 Formatting without commands	2717
	23.9.2 HTXFormatPage2xPatch1 patch	2718
	23.9.3 HTXFormatPage2xPatch2 patch	2719
	23.9.4 HTXFormatPage2xPatch2A patch	2719
	23.9.5 HTXFormatPage2xPatch3 patch	2719
	23.9.6 HTXFormatPage2xPatch3A patch	2720
	23.9.7 HTXFormatPage2xPatch4 patch	2720
	23.9.8 HTXFormatPage2xPatch4A patch	2721
23.10	htxformatpage3.ht	2721
	23.10.1 Using different fonts	2721
	23.10.2 HTXFormatPage3xPatch1 patch	2723
	23.10.3 HTXFormatPage3xPatch2 patch	2723
	23.10.4 HTXFormatPage3xPatch3 patch	2724
	23.10.5 HTXFormatPage3xPatch4 patch	2724
23.11	.htxformatpage4.ht	2724
	23.11.1 Indentation	
	23.11.2 HTXFormatPage4xPatch1 patch	2727
	23.11.3 HTXFormatPage4xPatch1A patch	
	23.11.4 HTXFormatPage4xPatch2 patch	
	$23.11.5HTXFormatPage 4x Patch 2A\ patch\ .\ .\ .\ .\ .\ .$	
	$23.11.6\mathrm{HTXFormatPage4xPatch3}\ \mathrm{patch}\ \ldots\ldots\ldots\ldots\ldots\ldots$	
	23.11.7 HTXFormatPage4xPatch3A patch	
	23.11.8 HTXFormatPage4xPatch4 patch	2728

23.11.9 HTXFormatPage4xPatch5 patch	. 2729
23.11.10HTXFormatPage4xPatch5A patch	2729
23.12htxformatpage5.ht	2730
23.12.1 Creating Lists and Tables	2730
23.12.2 HTXFormatPage5xPatch1 patch	2732
23.12.3 HTXFormatPage5xPatch1A patch	2733
23.12.4 HTXFormatPage5xPatch2 patch	
23.12.5 HTXFormatPage5xPatch2A patch	
23.12.6 HTXFormatPage5xPatch3 patch	
23.12.7 HTXFormatPage5xPatch3A patch	
23.13htxformatpage6	
23.13.1 Boxes and Lines	
23.13.2 HTXFormatPage6xPatch1 patch	
23.13.3 HTXFormatPage6xPatch2 patch	
23.14htxformatpage7	
23.14.1 Micro-Spacing	
23.14.1 HTXFormatPage7xPatch1 patch	
23.14.3 HTXFormatPage7xPatch2 patch	
<u> </u>	
23.14.4 HTXFormatPage7xPatch2A patch	
23.14.5 HTXFormatPage7xPatch3 patch	
23.14.6 HTXFormatPage7xPatch3A patch	
23.15htxformatpage8	
23.15.1 Bitmaps and Images	
23.15.2 HTXFormatPage8xPatch1 patch	
23.15.3 HTXFormatPage8xPatch2 patch	
23.15.4 HTXFormatPage8xPatch2A patch	
23.16htxformattoppage.ht	
23.16.1 Formatting in Hyperdoc	
23.17htxintropage1.ht	
23.17.1 What Hyperdoc does	2744
23.18htxintropage2.ht	
23.18.1 How Hyperdoc does it	
23.19htxintropage3.ht	2746
23.19.1 A simple text page	2746
23.20htxintrotoppage.ht	2748
23.20.1 First Steps	2748
23.21htxlinkpage1.ht	2749
23.21.1 Linking to a named page	
23.21.2 HTXLinkPage1xPatch1 patch	2751
23.21.3 HTXLinkPage1xPatch1A patch	
23.21.4 Test Help Page	
23.22htxlinkpage2.ht	
23.22.1 Standard Pages	
23.22.2 HTXLinkPage2xPatch1 patch	
23.22.3 HTXLinkPage2xPatch1A patch	
23 23htxlinknage3 ht	$\frac{2754}{2754}$

CONTENTS	129
----------	-----

	23.23.1 Active Axiom commands	754
	23.23.2 HTXLinkPage3xPatch1 patch	758
	23.23.3 HTXLinkPage3xPatch1A patch	758
	23.23.4 HTXLinkPage3xPatch2 patch	
	23.23.5 HTXLinkPage3xPatch2A patch	
	23.23.6 HTXLinkPage3xPatch3 patch	
	23.23.7 HTXLinkPage3xPatch3A patch	
	23.24htxlinkpage4.ht	
	23.24.1 Linking to Lisp	
	23.24.2 HTXLinkPage4xPatch1 patch	
	23.24.3 HTXLinkPage4xPatch1A patch	
	23.24.4 HTXLinkPage4xPatch2 patch	
	23.24.5 HTXLinkPage4xPatch2A patch	
	23.24.6 HTXLinkPage4xPatch3 patch	
	23.24.7 HTXLinkPage4xPatch3A patch	
	23.24.8 HTXLinkPage4xPatch4 patch	
	23.24.9 HTXLinkPage4xPatch4A patch	
	23.24.10HTXLinkPage4xPatch5 patch	
	23.24.1HTXLinkPage4xPatch5A patch	
	23.25htxlinkpage5.ht	
	23.25.1 Linking to Unix	
	23.25.2 HTXLinkPage5xPatch1 patch	
	23.25.3 HTXLinkPage5xPatch1A patch	
	23.25.4 HTXLinkPage5xPatch2 patch	
	23.25.5 HTXLinkPage5xPatch2A patch	
	23.26htxlinkpage6.ht	
	23.26.1 How to use your pages with Hyperdoc	
	23.26.2 HTXLinkPage6xPatch1 patch	
	23.26.3 HTXLinkPage6xPatch1A patch	
	23.26.4 HTXLinkPage6xPatch2 patch	
	23.26.5 HTXLinkPage6xPatch2A patch	
	23.27htxlinktoppage.ht	
	23.27.1 Actions in Hyperdoc	
	23.28htxtoppage.ht	
	23.28.1 Extending Hyperdoc	
	23.29htxtrypage.ht	
	23.29.1 Try out Hyperdoc	777
24	NAG Library Routines 277	70
44		1 3 779
	24.1.1 NAG On-line Documentation	
	24.1.1 NAG On-line Documentation	
	24.1.3 NAG Documentation: summary	
	24.1.4 NAG Documentation: keyword in context	
	24.1.5 NAG Documentation: conversion	
	24.2 Hagc.nt	913

	24.2.1	Zeros of Polynomials	
	24.2.2	Roots of a complex polynomial equation	
	24.2.3	Roots of a real polynomial equation	
	24.2.4	Roots of One or More Transcendental Equations	2928
	24.2.5	Zero of a continuous function in a given interval	2933
	24.2.6	Solution of a system of nonlinear equations	2937
	24.2.7	Solution of a system of nonlinear equations	2942
	24.2.8	Checks the gradients of a set of non-linear functions	2947
	24.2.9	Discrete Fourier transform of real or complex data values	2950
	24.2.10	Discrete Fourier transform of n real data values	2958
	24.2.11	Discrete Fourier transform of a Hermitian sequence	2962
	24.2.12	Discrete Fourier transform of n complex data values	2966
	24.2.13	Circular convolution or correlation of two real vectors	2969
	24.2.14	Discrete Fourier transforms of m sequences	2973
	24.2.15	Discrete Fourier transforms of m Hermitian sequences	2978
	24.2.16	Discrete Fourier transforms of m complex sequences	2983
	24.2.17	Discrete Fourier transform of bivariate complex data	2987
	24.2.18	Summation of Series	2992
	24.2.19	Complex conjugate of a sequence of n data values	2994
	24.2.20	Complex conjugates of m Hermitian sequences	2996
	24.2.21	Form real and imaginary parts of m Hermitian sequences	2999
24.3	nagd.ht		3002
	24.3.1	Quadrature	3002
	24.3.2	Approximation of the integral over a finite interval	3015
	24.3.3	Adaptive integration over a finite integral	3021
	24.3.4	Approximate integration with local singular points	3026
	24.3.5	Approximate integration over a (semi-)infinite interval	
	24.3.6	Approximate sine or cosine transform over finite interval	
	24.3.7	Adaptive integration of weighted function over an interval	
	24.3.8	Hilbert transform over finite interval	
	24.3.9	Approximate Sine or Cosine over $[a,\infty]$	3057
	24.3.10	Weights and abscissae for Gaussian quadrature formula	
		Multidimensional integrals with finite limits	
		Third-order finite-difference integration	
		Monte Carlo integration over hyper-rectangular regions	
		Ordinary Differential Equations	
		First-order ODE over an interval with initial conditions	
		First-order ODE with initial conditions and user function	
		First-order ODE with variable-order, variable-step	3106
		Stiff First-order ODE with variable order and step	3115
		Two-point boundary-value ODE	3124
		Two-point boundary value ODE with deferred correction	3131
		Eignevalue of regular singular 2nd-order Sturm-Liouville	3139
		Two-point boundary-value ODE equation systems	3161
		Partial differential equations	3174
		Discrete elliptic PDE on rectangular region	
		r · · · · · · · · · · · · · · · · · · ·	~ -

	24.3.25	Discrete 2nd-order elliptic PDE on rectangular regions	3189
	24.3.26	Helmholtz equation in 3 dimensions	3201
24.4	nage.ht		3210
	24.4.1	Interpolation	3210
	24.4.2	Cubic spline interpolant	3216
	24.4.3	Monoticity-preserving piecewise cubic Hermite interpolant	3221
	24.4.4	Piecewise cubic Hermite interpolant	3224
	24.4.5	Piecewise cubic Hermite interpolant and 1st deriv	3227
	24.4.6	Definite integral of piecewise cubic Hermite interpolant	3230
	24.4.7	Bicubic spline interpolated surface	3233
	24.4.8	Two-D surface interpolating a set of scattered data points	3239
	24.4.9	Evaluate 2D interpolant function from E01SAF	3243
	24.4.10	Generate 2D surface interpolating a scattered data points	3246
	24.4.11	Evaluate 2D interpolating function from E01SEF	3252
	24.4.12	Curve and Surface Fitting	3255
	24.4.13	Least-squares polynomial approximations	3279
	24.4.14	Evaluate polynomial from Chebyshev-series representation	3285
	24.4.15	Constrained weighted least-squares polynomial	3289
	24.4.16	Coefficients of polynomial derivative	3297
	24.4.17	Find coefficients of indefinite integral of polynomial	3302
	24.4.18	Evaluate polynomial in Chebyshev-series representation	3308
	24.4.19	Weighted least-squares aprrox to data points	3312
	24.4.20	Evaluates a cubic spline from its B-spline representation	3319
	24.4.21	Evaluate cubic spline and 3 derivatives from B-spline	3323
	24.4.22	Definite integral of cubic spline from B-spline	3329
	24.4.23	Cubic spline approximation to an arbitrary set points	3333
	24.4.24	Minimal, weighted least-squares bicubic spline fit	3342
	24.4.25	Bicubic spline approximation to a set of data values	3351
	24.4.26	Bicubic spline approximation to a set of scattered data	3362
	24.4.27	Calculates values of a bicubic spline from B-spline	3373
	24.4.28	Calculates values of a bicubic spline from B-spline	3377
	24.4.29	Calculates l_1 solution to over-determined system equations	3382
	24.4.30	Sorts two-dimensional data into rectangular panels	3388
	24.4.31	Minimizing or Maximizing a Function	3392
	24.4.32	Minimizes a nonlinear function of several variable	3416
	24.4.33	Supply optional parameters to E04DGF from file	3430
	24.4.34	Supply individual optional params to E04DGF	3434
	24.4.35	Finding an unconstrained minimum of a sum of squares	3437
	24.4.36	Finding an unconstrained minimum of a sum of squares	3443
	24.4.37	Finding a minimum of a function	3449
	24.4.38	Solving linear programming problems	3456
	24.4.39	Solving linear or quadratic problems	3464
	24.4.40	Minimize an arbitrary smooth constrainted function	3483
	24.4.41	Supply optional parameters to E04UCF from file	3531
	24.4.42	Supply individual optional params to E04UCF	3534
	24 4 43	Estimates of elements of the variance-covariance matrix	3537

2	24.5 nagf.ht		. 3544
	24.5.1	Linear Algebra	. 3544
	24.5.2	Matrix Factorization	. 3548
	24.5.3	Factorizes a real sparse matrix	. 3551
	24.5.4	Factorizes a real sparse matrix	. 3560
	24.5.5	Incomplete Cholesky factorization	. 3566
	24.5.6	Cholesky factor of a symmetric positive-definite matrix	. 3574
	24.5.7	QR factorization of the real m by n matrix A	
	24.5.8	$B := QB \text{ or } B := Q^T B \dots $. 3583
	24.5.9	First ncolq columns of the real m by m orthogonal matrix	
		QR factorization of the complex m by n matrix A	
	24.5.11	$B := QB \text{ or } B := Q^H B \dots$. 3598
	24.5.12	First noolq columns of the complex m by m unitary matrix	. 3604
	24.5.13	Eigenvalues and Eigenvectors	. 3609
	24.5.14	Calculates all the eigenvalues of a real symmetric matrix	. 3615
	24.5.15	Eigenvalues and eigenvectors of a real symmetric matrix	. 3618
	24.5.16	Calculates all the eigenvalues of $Ax = \lambda Bx \dots \dots$. 3621
	24.5.17	Eigenvalues and eigenvectors of $Ax = \lambda Bx$. 3624
	24.5.18	Calculates all the eigenvalues of a real unsymmetric matrix	. 3628
	24.5.19	Eigenvalues and eigenvectors of a real unsymmetric matrix	. 3631
	24.5.20	Calculates all the eigenvalues of a complex matrix	. 3634
	24.5.21	Eigenvalues and eigenvectors of a complex matrix	. 3637
	24.5.22	Eigenvalues of a complex Hermitian matrix	. 3640
	24.5.23	Eigenvalues/eigenvectors complex Hermitian matrix	. 3643
	24.5.24	Eigenvalues and eigenvectors of a real symmetric matrix	. 3647
	24.5.25	Eigenvalues of generalized eigenproblem $Ax = \lambda Bx$. 3651
	24.5.26	Eigenvalues and eigenvectors of real sparse symmetric problem	. 3656
	24.5.27	Singular value decomposition of a general real matrix	. 3669
	24.5.28	Singular value decomposition of a general complex matrix	. 3676
	24.5.29	Simultaneous Linear Equations	. 3684
	24.5.30	Approximate solution of a set of complex linear equations	. 3689
	24.5.31	Approximate solution of a set of real linear equations	. 3693
	24.5.32	Real symmetric positive-definite linear equations	. 3696
		Set of real linear equations with a single right-hand side	
		Solution of a set of real sparse linear equations	
		Real symmetric positive-definite tridiagonal linear equations	
		Solution of a linear least-squares problem, $Ax = b \dots \dots$	
	24.5.37	Sparse symmetric positive-definite system linear equations	. 3719
		Solves a system of real sparse symmetric linear equations	
	24.5.39	Solution of a system of real linear equations	. 3736
	24.5.40	Solves sparse unsymmetric equations	. 3741
		Linear Algebra Support Routines	
		Linear Equations (LAPACK)	
	24.5.43	Computes the LU factorization of a real m by n matrix	. 3787
		Solves a real system of linear equations	. 3790
	$24\ 5\ 45$	Factorization of a real symmetric positive-definite matrix	3794

		Real symmetric positive-definite system of linear equations	
		Sort vector of double precision numbers	
	24.5.48	Ranks a vector of double precision numbers	3807
		Ranks the rows of a matrix of double precision numbers	
		Ranks the columns of a matrix of double precision numbers	
	24.5.51	Rearranges a vector of double precision numbers	3815
	24.5.52	Inverts a permutation	3818
24.6	nags.ht		3821
	24.6.1	Approximations of Special Functions	3821
	24.6.2	Exponential function e^z , for complex $z \dots \dots \dots \dots \dots$	3833
	24.6.3	Returns the value of the exponential integral $E(x)$	3837
	24.6.4	Returns the value of the cosine integral	3840
	24.6.5	Returns the value of the sine integral	3843
	24.6.6	Returns the value of the Gamma function	3846
	24.6.7	Returns a value for the logarithm of the Gamma function	3850
	24.6.8	Incomplete gamma functions $P(a,x)$ and $Q(a,x)$	3854
	24.6.9	Returns the value of the complementary error function	
	24.6.10	Returns the value of the error function erfx	
		Returns the value of the Bessel Function $Y_0(x)$	
		Returns the value of the Bessel Function $Y_1(x)$	
		Returns the value of the Bessel Function $J_0(x)$	
		Returns the value of the Bessel Function $J_1(x)$	
		Returns a value for the Airy function, $Ai(x)$	
		Returns a value of the Airy function, $Bi(x)$	
		Value of the derivative of the Airy function $Ai(x)$	
		Value for the derivative of the Airy function $Bi(x)$	
		Values for the Bessel functions $Y_{\nu+n}(z)$	
		Values for the Bessel functions $J_{\nu+n}(z)$	
		Value of the Airy function $Ai(z)$ or derivative $Ai'(z)$	
		Value of the Airy function $Bi(z)$ or derivative $Bi'(z)$	
		Returns a sequence of values for the Hankel functions	
		Returns the value of the modified Bessel Function $K_0(x)$	
		Returns the value of the modified Bessel Function $K_1(x)$	
		Returns the value of the modified Bessel Function $I_0(x)$	
		Returns a value for the modified Bessel Function $I_1(x)$	
		Sequence of values for the modified Bessel $K_{\nu_n}(z)$	
		Sequence of values for the modified Bessel $I_{\nu+n}$	
		Returns a value for the Kelvin function ber $x cdots cd$	
		Returns a value for the Kelvin function bei x	
		Returns a value for the Kelvin function ker x	
		Returns a value for the Kelvin function keix	
		Returns a value for the Fresnel Integral $S(x)$	
		Returns a value for the Fresnel Integral $C(x)$	
		Returns a value of an elementary integral	
		Value of the symmetrised elliptic integral of first kind	
		Value of the symmetrised elliptic integral of second kind	
	2T.U.UO	voice of the symmetrised empire integral of second kind	0010

	24.6.39 Value of the symmetrised elliptic integral of third kind 3	984
24.7	nagx.ht	989
	24.7.1 Mathematical Constants	989
	24.7.2 Machine Constants	990
	24.7.3 Input/Output Utilities	996
	24.7.4 Value of the current error message unit number	998
	24.7.5 Value of the current advisory message unit number 4	
	24.7.6 Print a real matrix stored in a two-dimensional array 4	
	24.7.7 Print a complex matrix stored in a 2D array 4	
	24.7.8 Date and Time Utilities	
	24.7.9 Returns the current date and time	011
	24.7.10 From seven-integer format time and date to character string 4	012
	24.7.11 Compares two date/time character strings 4	
	24.7.12 Amount of processor time used	
	S ASP Example Code 403	
25.1	aspex.ht	021
	25.1.1 Asp1 Example Code	021
	25.1.2 Asp10 Example Code	021
	25.1.3 Asp12 Example Code	022
	25.1.4 Asp19 Example Code	022
	25.1.5 Asp20 Example Code	024
	25.1.6 Asp24 Example Code	025
	25.1.7 Asp27 Example Code	025
	25.1.8 Asp28 Example Code	026
	25.1.9 Asp29 Example Code	028
	25.1.10 Asp30 Example Code	029
	25.1.11 Asp31 Example Code	030
	25.1.12 Asp33 Example Code	030
	25.1.13 Asp34 Example Code	030
	25.1.14 Asp35 Example Code	031
	25.1.15 Asp4 Example Code	032
	25.1.16 Asp41 Example Code	032
	25.1.17 Asp42 Example Code	033
	25.1.18 Asp49 Example Code	034
	25.1.19 Asp50 Example Code	034
	25.1.20 Asp55 Example Code	035
	25.1.21 Asp6 Example Code	036
	25.1.22 Asp7 Example Code	037
	25.1.23 Asp73 Example Code	037
	25.1.24 Asp74 Example Code	037
	25.1.25 Asp77 Example Code	038
	25.1.26 Asp78 Example Code	038
	25.1.27 Asp8 Example Code	039
	25.1.28 Asp80 Example Code	040
	25.1.29 Asp9 Example Code	040

26 NAG ANNA Expert System	4041
26.1 annaex.ht	. 404
26.1.1 Axiom/NAG Expert System	. 404
26.1.2 Integration	. 4042
26.1.3 Ordinary Differential Equations	. 4042
26.1.4 Optimization	. 4043
26.1.5 Partial Differential Equations	. 4044
26.1.6 Examples Using the Axiom/NAG Expert System	. 404
26.1.7 Examples Using the Axiom/NAG Expert System	
26.1.8 Examples Using the Axiom/NAG Expert System	. 4046
26.1.9 Examples Using the Axiom/NAG Expert System	
26.1.10 About the Axiom/NAG Expert System	. 4049
26.1.11 Introduction to the Axiom/NAG Expert System	
26.1.12 Example using the Axiom/NAG Expert System	
26.1.13 Example using the Axiom/NAG Expert System	
26.1.14 Example using the Axiom/NAG Expert System	
26.1.15 Decision Agents	
26.1.16 Inference Mechanisms	
26.1.17 Method Domains	
26.1.18 Measure Functions	
26.1.19 Computational Agents	
27 ANNA Algebra Code	4063
28 Page hierarchy layout	4065
29 Makefile	4097
Bibliography	4099
Index	4101

Volume 8: Axiom Graphics

1	Ove	rview	1
	1.1	Environment Settings	1
		1.1.1 X11 .Xdefaults	1
		1.1.2 Shell Variables	2
	1.2	Pre-release change history	2
2	Gra	phics File Formats	7
	2.1	•	7
			7
		V 1	7
			7
			8
	2.2	The graph file format	
		2.2.1 The bounding values	-
	2.3	The parabola	
	$\frac{2.5}{2.4}$	3D graph information	
	2.1		
3	incl		
	3.1	actions.h	•
	3.2	colors.h	
	3.3	component.h	
	3.4	g.h	_
	3.5	nox10.h	
	3.6	override.h	
	3.7	rgb.h	_
	3.8	spadcolors.h	
	3.9	tube.h	
		view2d.h	8
		view3d.h	
		viewcommand.h	
		view.h	2
	3.14	write.h	4
	3.15	xdefs.h	4
4	view	vman 73	3
	4.1	viewman Call Graph	3
	4.2	Constants and Headers	5
		4.2.1 defines	5
		4.2.2 System includes	6
		4.2.3 Local includes	
		4.2.4 extern references	
		4.2.5 forward references	7
		4.2.6 global variables	
		\sim	

	4.3	Code .	78
		4.3.1	endChild
		4.3.2	rmViewMgr
		4.3.3	closeChildViewport
		4.3.4	goodbye
		4.3.5	funView2D
		4.3.6	forkView2D
		4.3.7	sendGraphToView2D
		4.3.8	funView3D
		4.3.9	forkView3D
		4.3.10	makeView2DFromSpadData
			makeView3DFromSpadData
			makeGraphFromSpadData
			discardGraph
			readViewport
			superSelect
			brokenPipe
			main
		1.0.1.	
5	view	alone	101
	5.1	viewalo	one Call Graph
	5.2	Consta	ants and Headers
		5.2.1	System includes
		5.2.2	Local includes
		5.2.3	defines
		5.2.4	extern references
		5.2.5	global variables
	5.3	Code .	104
		5.3.1	sendGraphToView2D
		5.3.2	makeView2DFromFileData
		5.3.3	makeView3DFromFileData
		5.3.4	spoonView2D
		5.3.5	spoonView3D
		5.3.6	main
6	view	72d	117
	6.1		l Call Graph
	6.2		ants and Headers
		6.2.1	System includes
		6.2.2	local includes
		6.2.3	static variables
		6.2.4	structs
		6.2.5	defines
		6.2.6	extern references
		6.2.7	forward references
		6.2.8	global variables

	6.3	Code .	
		6.3.1	initButtons
		6.3.2	writeControlTitle
		6.3.3	makeMessageFromData
		6.3.4	writeControlMessage
		6.3.5	drawControlPanel
		6.3.6	getControlXY
			<u> </u>
		6.3.7	makeControlPanel
		6.3.8	putControlPanelSomewhere
		6.3.9	clearControlMessage
		6.3.10	getGraphFromViewman
		6.3.11	freeGraph
		6.3.12	mergeDatabases
		6.3.13	getPotValue
		6.3.14	doPick
			doDrop
			clickedOnGraphSelect
			drawControlPushButton
			buttonAction
			processEvents
			clickedOnGraph
			readViewman
			spadAction
			absolute
		6.3.24	goodbye
		6.3.25	writeTitle
		6.3.26	drawTheViewport
		6.3.27	makeViewport
			makeView2D
			writeViewport
			main
		0.0.00	main
7	view	v3d	199
	7.1	view3d	l Call Graph
	7.2		ants and Headers
	1.2	7.2.1	System includes
		7.2.1	Local includes
		– . –	• •
		7.2.3	defines
		7.2.4	static variables
		7.2.5	structs
		7.2.6	extern references
		7.2.7	forward references
		7.2.8	global variables
	7.3	Code .	238
		7.3.1	initButtons
		7.3.2	closeViewport
			•

CONTENTS	139
----------	-----

7.3.3	$scale Components \ \dots $	245
7.3.4	makeTriangle	246
7.3.5	triangulate	247
7.3.6	${\it read Components From Viewman} \ \dots $	249
7.3.7	calcNormData	250
7.3.8	make3DComponents	251
7.3.9	draw3DComponents	252
7.3.10	drawColorMap	259
7.3.11	writeControlTitle	260
7.3.12		
7.3.13	writeControlMessage	
	drawControlPanel	
	getControlXY	
	makeControlPanel	
	putControlPanelSomewhere	
	phong	
7.3.19		
	getHue	
	~	
	Value	
	hlsTOrgb	
	initLightButtons	
	makeLightingPanel	
	drawLightingAxes	
	drawLightTransArrow	
7.3.27	0 0	
7.3.28		
7.3.29	0	
7.3.30		
7.3.31		
7.3.32	dotProduct	290
7.3.33	merge	290
7.3.34	msort	291
7.3.35	getPotValue	292
7.3.36	getLinearPotValue	292
7.3.37	buttonAction	292
7.3.38	processEvents	306
	project	
7.3.40	projectAPoint	
7.3.41	1 0	320
7.3.42	1 0	321
7.3.43		322
		323
7.3.45	1 0	324
7.3.46	•	325
7.3.47	-	326
	makeSavePanel	
1.0.40		041

	drawSavePanel	
	initSaveButtons	
	getCBufferAxes	
	putCBufferAxes	
	getCBufferIndx	
7.3.54	putCBufferIndx	330
7.3.55	putZBuffer	330
7.3.56	getZBuffer	331
7.3.57	putImageX	331
7.3.58	drawPhongSpan	331
7.3.59	scanPhong	332
7.3.60	boxTObuffer	335
7.3.61	clipboxTObuffer	336
7.3.62	axesTObuffer	337
7.3.63	scanLines	338
7.3.64	freePolyList	341
7.3.65	showAxesLabels	342
7.3.66	makeTriangle	343
7.3.67	drawPhong	344
7.3.68	readViewman	347
7.3.69	scalePoint	347
7.3.70	spadAction	347
7.3.71	traverse	353
7.3.72	absolute	353
7.3.73	getRandom	353
7.3.74	normDist	353
7.3.75	goodbye	354
7.3.76	drawLineComponent	354
7.3.77	drawOpaquePolygon	355
7.3.78	copyPolygons	356
7.3.79	minMaxPolygons	358
7.3.80	polyCompare	359
7.3.81	makeTriangle	359
7.3.82	makeTriangle	359
7.3.83	freePointResevoir	362
7.3.84	freeListOfPolygons	
7.3.85	drawPolygons	362
7.3.86	lessThan	365
7.3.87	greaterThan	365
7.3.88	isNaN	366
7.3.89	isNaNPoint	366
7.3.90	equal	366
7.3.91	$matrix Multiply 4x 4 \dots $	366
7.3.92		367
7.3.93		367
7.3.94	ROTATE1	368

CONTENTS	141

		7.3.95 SCALE
		7.3.96 TRANSLATE
		7.3.97 writeTitle
		7.3.98 drawPreViewport
		7.3.99 drawTheViewport
		7.3.100 makeViewport
		7.3.101 postMakeViewport
		7.3.102 keepDrawingViewport
		7.3.103 init Volume Buttons
		7.3.104 makeVolumePanel
		7.3.105 drawClipXBut
		7.3.106 drawClipYBut
		7.3.107 drawClipZBut
		7.3.108 drawClipVolume
		7.3.109 drawHitherControl
		7.3.110 drawEyeControl
		7.3.111 drawFrustrum
		7.3.112 drawVolumePanel
		7.3.113 writeViewport
		7.3.114 main
		1.0.11111110111
8	gdra	$_{ m aws}$
	J	8.0.115 Gdraw
		8.0.116 To use G Functions
	8.1	gfun.c
		8.1.1 filecopy
		8.1.2 PSCreateFile
		8.1.3 GdrawsDrawFrame
		8.1.4 GdrawsSetDimension
		8.1.5 GDrawImageString
		8.1.6 GDrawArc
		8.1.7 GDrawLine
		8.1.8 GDrawLines
		8.1.9 GDrawPoint
		8.1.10 GDrawRectangle
		8.1.11 GDraw3DButtonIn
		8.1.12 GDraw3DButtonIn
		8.1.13 GDrawPushButton
		8.1.14 GDrawString
		8.1.15 GFillArc
		8.1.16 PSGlobalInit
		8.1.17 PSInit
		8.1.18 PSCreateContext
		8.1.19 PSfindGC
		8.1.20 GSetForeground
		9
		8.1.21 GSetBackground

		8.1.22	GSetLineAttributes
		8.1.23	PSClose
		8.1.24	centerX
		8.1.25	centerY
		8.1.26	PSColorPolygon
			PSColorwOutline
			PSDrawColor
			PSFillPolygon
			PSFillwOutline
			TrivEqual
			TrivHashCode
			XCreateAssocTable
		0.2.00	XMakeAssoc
		-	XLookUpAssoc
			XDeleteAssoc
	8.2		ostscript command definitions
	0.2	8.2.1	colorpoly
		8.2.2	colorwol
		8.2.3	drawarc
		8.2.4	drawcolor
		8.2.5	drawIstr
		8.2.6	drawline
		8.2.7	drawlines
		8.2.8	drawpoint
		8.2.9	draw
		8.2.10	drawrect
			drawstr
		8.2.12	drwfilled
		8.2.13	end
		8.2.14	fillarc
		8.2.15	fillpoly
		8.2.16	fillwol
		8.2.17	header
		8.2.18	setup
9		APIs	445
	9.1	Graph	ics API
		9.1.1	XDrawString
		9.1.2	XDrawPoint
		9.1.3	XDrawLine
		9.1.4	XDrawImageString
		9.1.5	XFillArc
		9.1.6	XDrawArc
		9.1.7	XSetForeground
		9.1.8	XSetBackground
		9.1.9	$XSetLineAttributes \dots \dots$

CONTENTS 143		
9.1.11 RootWindow	450 450 450 450 451	
10 libspad	457	
	457	
	462	
	465	
10.4 edin.c	467	
10.5 emupty.c	484	
- *	488	
10.7 halloc.c	494	
10.8 hash.c	495	
10.9 openpty.c	499	
10.10pixmap.c	503	
r	509	
10.12sockio-c.c	516	
F	535	
	546	
	548	
	562	
	565	
	569	
	574	
10.19.1 edible Call Graph	574	
11 Makefile	589	
Bibliography	593	
Index	595	

Volume 8.1: Axiom Gallery

1	Ger	ieral e	xamples 1
	1.1	Two d	limensional functions
		1.1.1	A Simple Sine Function
		1.1.2	A Simple Sine Function, Non-adaptive plot
		1.1.3	A Simple Sine Function, Drawn to Scale
		1.1.4	A Simple Sine Function, Polar Plot
		1.1.5	A Simple Tangent Function, Clipping On 6
		1.1.6	A Simple Tangent Function, Clipping On
		1.1.7	Tangent and Sine
		1.1.8	A 2D Sine Function in BiPolar Coordinates
		1.1.9	A 2D Sine Function in Elliptic Coordinates
		1.1.10	
	1.2	Two d	limensional curves
		1.2.1	A Line in Parabolic Coordinates
		1.2.2	Lissajous Curve
		1.2.3	A Parametric Curve
		1.2.4	A Parametric Curve in Polar Coordinates
	1.3	Three	dimensional functions
		1.3.1	A 3D Constant Function in Elliptic Coordinates
		1.3.2	A 3D Constant Function in Oblate Spheroidal
		1.3.3	A 3D Constant in Polar Coordinates
		1.3.4	A 3D Constant in Prolate Spheroidal Coordinates
		1.3.5	A 3D Constant in Spherical Coordinates
		1.3.6	A 2-Equation Space Function
	1.4	Three	dimensional curves
		1.4.1	A Parametric Space Curve
		1.4.2	A Tube around a Parametric Space Curve
		1.4.3	A 2-Equation Cylindrical Curve
	1.5	Three	dimensional surfaces
		1.5.1	A Icosahedron
		1.5.2	A 3D figure 8 immersion (Klein bagel)
		1.5.3	A 2-Equation bipolarCylindrical Surface
		1.5.4	A 3-Equation Parametric Space Surface
		1.5.5	A 3D Vector of Points in Elliptic Cylindrical
		1.5.6	A 3D Constant Function in BiPolar Coordinates
		1.5.7	A Swept in Parabolic Coordinates
		1.5.8	A Swept Cone in Parabolic Cylindrical Coordinates
		1.5.9	A Truncated Cone in Toroidal Coordinates
		1.5.10	A Swept Surface in Paraboloidal Coordinates
2	Jen		ok images 37
		2.0.11	The Complex Gamma Function
		2.0.12	The Complex Arctangent Function 39

CONTENTS	145

3	Hyp	perdoc examples 41
	3.1	Two dimensional examples
		3.1.1 A function of one variable
		3.1.2 A Parametric function
		3.1.3 A Polynomial in 2 variables
	3.2	Three dimensional examples
		3.2.1 A function of two variables
		3.2.2 A parametrically defined curve
		3.2.3 A parametrically defined surface
	GD.	
4		C Standard Curves and Surfaces 49 Standard Curves and Surfaces
	4.1	
	4.2	CRC graphs
		4.2.3 Functions with $a^2 + x^2$ and x^m
		4.2.5 Functions with $a^3 + x^3$ and x^m
		4.2.6 Functions with $a^3 - x^3$ and x^m
		4.2.7 Functions with $a^4 + x^4$ and x^m
		4.2.8 Functions with $a^4 - x^4$ and x^m
		4.2.9 Functions with $(a + bx)^{1/2}$ and x^m
5	Past	ta by Design 207
	5.1	Acini Di Pepe
	5.2	Agnolotti
	5.3	Anellini
	5.4	Bucatini
	5.5	Buccoli
	5.6	Calamaretti
	5.7	Cannelloni
	5.8	Cannolicchi Rigati
	5.9	Capellini
	5.10	Cappelletti
		Casarecce
		Castellane
		Cavatappi
		Cavatelli
		Chifferi Rigati
		Colonne Pompeii
		Conchiglie Rigate
		Conchigliette Lisce
		Conchiglioni Rigate
		Corallini Lisci
		Creste Di Galli
		Couretti

5.23 Ditali Rigati 231 5.24 Fagottini .323 5.25 Farfalle .235 5.26 Farfalline .235 5.27 Farfalloni .236 5.28 Festonati .237 5.29 Fettuccine .238 5.30 Fiocchi Rigati .239 5.31 Fisarmoniche .240 5.32 Funghini .241 5.33 Fusilli al Ferretto .243 5.35 Fusilli Capri .244 5.35 Fusilli Capri .244 5.35 Fusilli Capri .244 5.36 Fusilli Lunghi Bucati .245 5.37 Galletti .245 5.38 Garganelli .248 5.39 Gemelli .249 5.40 Gigli .250 5.41 Giglio Ondulato .251 5.42 Gnocchetti Sardi .252 5.43 Gnocchi .253 5.44 Gramigna .254 5.45 Lancette .255 5.46 Lasagna Larga Doppia Riccia .256 5.47 Linguine .256 5.48 Lumaconi Rigati .258 5.59 Manicotti .262 5.53 Orecch			
5.24 Fagottini 232 5.25 Farfalle 233 5.26 Farfalline 235 5.27 Farfalloni 236 5.28 Festonati 237 5.29 Fettuccine 238 5.30 Fiocchi Rigati 239 5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Lunghi Bucati 245 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 248 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Cramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264<	5.23	B Ditali Rigati	231
5.26 Farfalline 235 5.27 Farfalloni 236 5.28 Festonati 237 5.29 Fettuccine 238 5.30 Fiocchi Rigati 239 5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 243 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 258 5.50 Manicotti 260 5.51 Mafaldine 261 5.52 Pappardelle 265 5.53 Orecchiette 263 5.55 Pennoni Rigati 268			
5.27 Farfalloni 236 5.28 Festonati 237 5.29 Fettuccine 238 5.30 Fiocchi Rigati 239 5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 244 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Pappardelle 262 5.55 Pappardelle 265 5.56 Penno Rigate 266 5.57 Pennoni Lisci	5.25	Farfalle	233
5.28 Festonati 237 5.29 Fettuccine 238 5.30 Fiocchi Rigati 239 5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 248 5.39 Gemelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Luncette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 263 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266<	5.26	Farfalline	235
5.29 Fettuccine 238 5.30 Fiocchi Rigati 239 5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 252 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 256 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Pappardelle 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pennoni Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigate	5.27	⁷ Farfalloni	236
5.30 Fiocchi Rigati 239 5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pennoni Rigati 265 5.56 Penne Rigate 266 5.57 Pennoni Rigati 268 5.59 Puntalette	5.28	B Festonati	237
5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Pennoni Rigati 268 5.57 Pennoni Rigati 268 5.59 Puntalette 260 5.59 Pennoni Rigati	5.29	Fettuccine	238
5.31 Fisarmoniche 240 5.32 Funghini 241 5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Pennoni Rigati 268 5.57 Pennoni Rigati 268 5.59 Puntalette 260 5.59 Pennoni Rigati	5.30) Fiocchi Rigati	239
5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Raciette 272 5.62 Racchette 27			
5.33 Fusilli 242 5.34 Fusilli al Ferretto 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Raciette 272 5.62 Racchette 27	5.32	Prunghini	241
5.34 Fusilli Capri 243 5.35 Fusilli Capri 244 5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnoccheti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 258 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272<		\circ	
5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.65 Ravioli Tondi 275 <td></td> <td></td> <td></td>			
5.36 Fusilli Lunghi Bucati 245 5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.65 Ravioli Tondi 275 <td></td> <td></td> <td></td>			
5.37 Galletti 247 5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadretii 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275		•	
5.38 Garganelli 248 5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 258 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.39 Gemelli 249 5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.65 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.40 Gigli 250 5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275		<u> </u>	
5.41 Giglio Ondulato 251 5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.42 Gnocchetti Sardi 252 5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275		9	
5.43 Gnocchi 253 5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 265 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.44 Gramigna 254 5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.45 Lancette 255 5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.46 Lasagna Larga Doppia Riccia 256 5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.47 Linguine 257 5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.48 Lumaconi Rigati 258 5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.8 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275		~ ~ ~	
5.49 Maccheroni 259 5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275		o contract the contract to the	
5.50 Maccheroni Alla Chitarra 260 5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275		<u> </u>	
5.51 Mafaldine 261 5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.52 Manicotti 262 5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.53 Orecchiette 263 5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.54 Paccheri 264 5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.55 Pappardelle 265 5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.56 Penne Rigate 266 5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.57 Pennoni Lisci 267 5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.58 Pennoni Rigati 268 5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.59 Puntalette 269 5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.60 Quadrefiore 270 5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.61 Quadretti 271 5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.62 Racchette 272 5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275		·	
5.63 Radiatori 273 5.64 Ravioli Quadrati 274 5.65 Ravioli Tondi 275			
5.64 Ravioli Quadrati			
5.65 Ravioli Tondi			
9.00 IUCCIOH		, marion fondi	410
	J.00	3. Riccioli	276
9.01 Incom at onique papon	5.65		$\frac{276}{277}$

CONTE	ENTS	147
5 69	Rombi	279
	Rotelle	
	Sagnarelli	
	Sagne Incannulate	
	Scialatielli	
	Spaccatelle	
	Spaghetti	
	Stellette	
	Stortini	
	Strozzapreti	
	•	
	Taglierini	
	Tagliolini	
	Torchietti	
5.85	Tortellini	295
	Tortiglioni	
	Trenne	
	Tripoline	
	Trofie	
5.90	Trottole	300
5.91	Tubetti Rigati	301
5.92	Ziti	302
$\mathbf{Bibliog}$	raphy	303
Index		305

Volume 9: Axiom Compiler

1	The	Axiom Compiler 1									
	1.1	Makefile									
2	Ove	Overview 3									
	2.1	Syntax by Jacob Smith									
		2.1.1 Language features									
		2.1.2 Sematics									
	2.2	The Input									
	2.3	The Output, the EQ.nrlib directory									
	2.4	The code.lsp and EQ.lsp files									
	2.5	The code.o file									
	2.6	The info file									
	2.7	The EQ.fn file									
	2.8	The index.kaf file									
		2.8.1 The index offset byte									
		2.8.2 The "loadTimeStuff"									
		2.8.3 The "compilerInfo"									
		2.8.4 The "constructorForm"									
		2.8.5 The "constructorKind"									
		2.8.6 The "constructorModemap"									
		2.8.7 The "constructorCategory"									
		2.8.8 The "sourceFile"									
		2.8.9 The "modemaps"									
		2.8.10 The "operationAlist"									
		2.8.11 The "superDomain"									
		2.8.12 The "signaturesAndLocals"									
		2.8.13 The "attributes"									
		2.8.14 The "predicates"									
		2.8.15 The "abbreviation"									
		2.8.16 The "parents"									
		2.8.17 The "ancestors"									
		2.8.18 The "documentation"									
		2.8.19 The "slotInfo"									
		2.8.20 The "index"									
3	Con	Compiler top level 63									
	3.1	Spad Program Representation									
	3.2	Global Data Structures									
	3.3	Pratt Parsing									
	3.4)compile									
		3.4.1 Spad compiler									
	3.5	Operator Precedence Table Initialization									
		3.5.1 LED and NUD Tables 68									

149

	3.6	Gliph Table
		3.6.1 Rename Token Table
		3.6.2 Generic function table
	3.7	Giant steps, Baby steps
4	The	Parser 73
	4.1	EQ.spad
	4.2	boot transformations
		4.2.1 defun string2BootTree
		4.2.2 defun new2OldLisp
		4.2.3 defun new2OldTran
		4.2.4 defun newIf2Cond
		4.2.5 defun newDef2Def
		4.2.6 defun new2OldDefForm
		4.2.7 defun newConstruct
	4.3	preparse
		4.3.1 defvar \$index
		4.3.2 defvar \$linelist
		4.3.3 defvar \$echolinestack
		4.3.4 defvar \$preparse-last-line
	4.4	Parsing routines
		4.4.1 defun initialize-preparse
		4.4.2 defun preparse
		4.4.3 defun Build the lines from the input for piles
		4.4.4 defun skip-ifblock
		4.4.5 defun preparseReadLine1
		4.4.6 defun expand-tabs
	4.5	I/O Handling
	1.0	4.5.1 defun preparse-echo
		4.5.2 Parsing stack
		4.5.3 defstruct stack
		4.5.4 defun stack-load
		4.5.5 defun stack-clear
		4.5.6 defmacro stack-/-empty
		4.5.7 defun stack-push
		4.5.8 defun stack-pop
		4.5.9 Parsing token 95 4.5.10 defstruct token 95
		4.5.11 defvar prior-token
		4.5.11 delvar prior-token
		4.5.13 defvar current-token
		4.5.14 defvar next-token
		4.5.15 defvar valid-tokens
		4.5.16 defun token-install
		4.5.17 defun token-print
		4.5.18 Parsing reduction

		4.5.19	defstruct reduction
5	Par		nsformers 99
	5.1		called parse routines
		5.1.1	defun parseTransform
		5.1.2	defun parseTran
		5.1.3	defun parseAtom
		5.1.4	defun parseTranList
		5.1.5	defplist parseConstruct
		5.1.6	defun parseConstruct
	5.2	Indire	et called parse routines
		5.2.1	defplist parseAnd
		5.2.2	defun parseAnd
		5.2.3	defplist parseAtSign
		5.2.4	defun parseAtSign
		5.2.5	defun parseType
		5.2.6	defplist parseCategory
		5.2.7	defun parseCategory
		5.2.8	defun parseDropAssertions
		5.2.9	defplist parseCoerce
		5.2.10	defun parseCoerce
			defplist parseColon
		5.2.12	defun parseColon
		5.2.13	defplist parseDEF
			defun parseDEF
		5.2.15	defun parseLhs
		5.2.16	defun transIs
		5.2.17	defun transIs1
		5.2.18	defun isListConstructor
			defplist parseDollarGreaterthan
		5.2.20	defun parseDollarGreaterThan
			defplist parseDollarGreaterEqual
			defun parseDollarGreaterEqual
			defun parseDollarLessEqual
			defplist parseDollarNotEqual
			defun parseDollarNotEqual
			defplist parseEquivalence
		5.2.27	defun parseEquivalence
		5.2.28	defplist parseExit
		5.2.29	defun parseExit
		5.2.30	defplist parseGreaterEqual
		5.2.31	defun parseGreaterEqual
		5.2.32	defplist parseGreaterThan
		5.2.33	defun parseGreaterThan
			defplist parseHas
		5.2.35	defun parseHas

	defun parseHasRhs	
	defun loadLibIfNecessary	
5.2.38	$\label{lem:defunction} \mbox{defun updateCategoryFrameForConstructor} \ \dots \dots \dots \dots \dots \dots \dots$	115
5.2.39	defun convertOpAlist2compilerInfo	116
5.2.40	defun updateCategoryFrameForCategory	116
5.2.41	defplist parseIf	117
5.2.42	defun parseIf	117
5.2.43	defun parseIf,ifTran	117
5.2.44	defplist parseImplies	119
	defun parseImplies	
5.2.46	defplist parseIn	120
	defun parseIn	
	defplist parseInBy	
	defun parseInBy	
	defplist parsels	
	defun parseIs	
	defplist parseIsnt	
	defun parseIsnt	
	defplist parseJoin	
	defun parseJoin	
	defplist parseLeave	
	defun parseLeave	
	defplist parseLessEqual	
	defun parseLessEqual	
	defplist parseLET	
	defun parseLET	
	defplist parseLETD	
	defun parseLETD	
	defplist parseMDEF	
	defun parseMDEF	
	defplist parseNot	
	defplist parseNot	
	defun parseNot	
	defplist parseNotEqual	
	defun parseNotEqual	
	defplist parseOr	
	defun parseOr	
	defplist parsePretend	
5.2.74	defun parsePretend	128
	defplist parseReturn	128
	defun parseReturn	129
5.2.77	defplist parseSegment	129
5.2.78	defun parseSegment	129
	defplist parseSeq	129
	defun parseSeq	130
	defplist parseVCONS	130

		5.2.82	defun parseVCONS
			defplist parseWhere
		5.2.84	defun parseWhere
6	Con		ransformers 133
			defun compExpression
	6.1		ne Category DEF forms
		6.1.1	defplist compDefine plist
		6.1.2	defun compDefine
		6.1.3	defun compDefine1
		6.1.4	defun compDefineAddSignature
		6.1.5	defun compDefineFunctor
		6.1.6	defun compDefineFunctor1
		6.1.7	defun compDefineCapsuleFunction
		6.1.8	defun compInternalFunction
		6.1.9	defun compDefWhereClause
		6.1.10	defun compDefineCategory
		6.1.11	defun compDefineCategory1
		6.1.12	defun compDefineCategory2
		6.1.13	defun compDefineLisplib
		6.1.14	defun compileDocumentation
		6.1.15	defun compArgumentConditions
		6.1.16	defun compileCases
		6.1.17	defun compFunctorBody
		6.1.18	defun compile
		6.1.19	defvar \$NoValueMode
		6.1.20	defvar \$EmptyMode
		6.1.21	defun hasFullSignature
		6.1.22	defun addEmptyCapsuleIfNecessary
			defun getTargetFromRhs
			defun giveFormalParametersValues
			defun macroExpandInPlace
			defun macroExpand
			defun macroExpandList
			defun makeCategoryPredicates
			defun mkCategoryPackage
			defun mkEvalableCategoryForm
			defun encodeFunctionName
			defun mkRepititionAssoc
			defun splitEncodedFunctionName
			defun encodeItem
			defun getCaps
			defun constructMacro
			defun spadCompileOrSetq
			defun compileConstructor
			defun compileConstructor1
		0.1.09	defull complication in the contraction of the complication of the contraction of the cont

	defun compAndDefine	
	defun putInLocalDomainReferences	
6.1.42	defun NRTputInTail	. 178
6.1.43	defun NRTputInHead	. 178
6.1.44	defun getArgumentModeOrMoan	. 179
6.1.45	defun augLisplibModemapsFromCategory	. 180
6.1.46	defun mkAlistOfExplicitCategoryOps	. 181
6.1.47	defun flattenSignatureList	. 182
	defun interactiveModemapForm	
	defun replaceVars	
	defun fixUpPredicate	
	defun orderPredicateItems	
	defun signatureTran	
	defun orderPredTran	
6.1.54	defun isDomainSubst	. 188
6.1.55	defun moveORsOutside	. 188
6.1.56	defun substVars	. 189
6.1.57	defun modemapPattern	. 190
6.1.58	defun evalAndRwriteLispForm	. 191
	defun rwriteLispForm	
	defun mkConstructor	
	defun unloadOneConstructor	
	defun lisplibDoRename	
	defun initializeLisplib	
	defun writeLib1	
	defun finalizeLisplib	
	defun getConstructorOpsAndAtts	
	defun getCategoryOpsAndAtts	
	defun getSlotFromCategoryForm	
	defun transformOperationAlist	
	defun getFunctorOpsAndAtts	
	defun getSlotFromFunctor	
	defun compMakeCategoryObject	
	defun mergeSignatureAndLocalVarAlists	
6.1.74	defun lisplibWrite	. 199
	defun isCategoryPackageName	
	defun NRTgetLookupFunction	
	defun NRTgetLocalIndex	
	defun augmentLisplibModemapsFromFunctor	
6.1.79	defun allLASSOCs	
6.1.80	defun formal2Pattern	
6.1.81	defun mkDatabasePred	
6.1.82	defun disallowNilAttribute	
6.1.83	defun bootStrapError	
	defun reportOnFunctorCompilation	
	defun displayMissingFunctions	
	- v ~	

	6.1.86	defun makeFunctorArgumentParameters	206
	6.1.87	defun genDomainViewList0	208
	6.1.88	defun genDomainViewList	208
	6.1.89	defun genDomainView	208
	6.1.90	defun genDomainOps	209
	6.1.91	defun mkOpVec	210
		defun AssocBarGensym	
		defun orderByDependency	
6.2		optimization routines	
•	6.2.1	defun optimizeFunctionDef	
	6.2.2	defun optimize	
	6.2.3	defun optXLAMCond	
	6.2.4	defun optCONDtail	
	6.2.5	defvar \$BasicPredicates	
	6.2.6	defun optPredicateIfTrue	
	6.2.7	defun optiF2COND	
	6.2.8	defun subrname	
	6.2.9	Special case optimizers	
	-		
		defplist optCall	
		defun optPackageCall	
		defun optCallSpecially	
	6.2.14	defun optSpecialCall	219
		defun compileTimeBindingOf	
		defun optCallEval	
		defplist optSEQ	
		defun optSEQ	
		defplist optEQ	
		defun optEQ	
		defplist optMINUS	
		defun optMINUS	
		defplist optQSMINUS	
		defun optQSMINUS	
		defplist opt	
		defun opt	
		defplist optLESSP	
		defun optLESSP	
	6.2.29	defplist optSPADCALL	225
	6.2.30		225
	6.2.31	defplist optSuchthat	226
	6.2.32	defun optSuchthat	226
	6.2.33	defplist optCatch	226
	6.2.34	defun optCatch	227
	6.2.35	defplist optCond	228
	6.2.36	defun optCond	228
	6 2 37	defun FaualBarConsym	33U

		defplist optMkRecord	
	6.2.39	defun optMkRecord	231
	6.2.40	defplist optRECORDELT	231
	6.2.41	defun optRECORDELT	231
	6.2.42	defplist optSETRECORDELT	232
		defun optSETRECORDELT	
		defplist optRECORDCOPY	
		defun optRECORDCOPY	
6.3		ons to manipulate modemaps	
	6.3.1	defun addDomain	
	6.3.2	defun unknownTypeError	234
	6.3.3	defun isFunctor	
	6.3.4	defun getDomainsInScope	
	6.3.5	defun putDomainsInScope	
	6.3.6	defun isSuperDomain	
	6.3.7	defun addNewDomain	
	6.3.8	defun augModemapsFromDomain	
	6.3.9	defun augModemapsFromDomain1	
		defun substituteCategoryArguments	
		defun addConstructorModemaps	
		defun getModemap	
		defun compApplyModemap	
		defun compMapCond	
		defun compMapCond'	
		defun compMapCond"	
		defun compMapCondFun	
		defun getUniqueSignature	
		defun getUniqueModemap	
		defun getModemapList	
		defun getModemapListFromDomain	
		defun domainMember	
		defun augModemapsFromCategory	
		defun addEltModemap	
		defun mkNewModemapList	
		defun insertModemap	
		defun mergeModemap	
		defun TruthP	
		defun evalAndSub	
	0.00	defun getOperationAlist	
	6.3.31	defvar \$FormalMapVariableList	
	6.3.32	defun substNames	
	0.0.0=		
6.4		defun augModemapsFromCategoryRep	
0.4	6.4.1	defun addModemapKnown	
	6.4.2	defun addModemap	
	6.4.3	defull addiviodelliapu	202

	6.4.4	defun add Modemap 1		 	 	 		253
6.5	Indirec	et called comp routines		 	 	 		253
	6.5.1	defplist compAdd plist		 	 	 		253
	6.5.2	$defun\ compAdd\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .$						
	6.5.3	defun compTuple2Record		 	 	 		256
	6.5.4	defplist compCapsule plist		 	 	 		256
	6.5.5	defun compCapsule		 	 	 		256
	6.5.6	defun compCapsuleInner		 	 	 		257
	6.5.7	defun processFunctor						
	6.5.8	defun compCapsuleItems						
	6.5.9	defun compSingleCapsuleItem						
	6.5.10	defun doIt						
	6.5.11	defun doItIf		 	 	 		262
		defun isMacro						
	6.5.13	defplist compCase plist		 	 	 		264
		defun compCase						
	6.5.15	defun compCase1		 	 	 		265
	6.5.16	defplist compCat plist		 	 	 		266
	6.5.17	defplist compCat plist		 	 	 		266
	6.5.18	defplist compCat plist		 	 	 		266
	6.5.19	defun compCat		 	 	 		266
	6.5.20	defplist compCategory plist		 	 	 		267
	6.5.21	defun compCategory		 	 	 		267
	6.5.22	defun compCategoryItem		 	 	 		268
	6.5.23	${\it defun\ mkExplicitCategoryFunction\ .\ .\ .}$		 	 	 		269
		defun mustInstantiate						
		defun wrapDomainSub						
	6.5.26	defplist compColon plist		 	 	 		271
		defun compColon						
		defun makeCategoryForm						
	6.5.29	defplist compCons plist		 	 	 		274
		defun compCons						
		defun compCons1						
	6.5.32	defplist compConstruct plist		 	 	 		275
		defun compConstruct						
		defplist compConstructorCategory plist						
		defplist compConstructorCategory plist						277
	6.5.36	${\it defplist\ compConstructorCategory\ plist}$		 	 	 		277
	6.5.37	defplist compConstructorCategory plist		 	 	 		277
	6.5.38	defun compConstructorCategory		 	 	 		277
	6.5.39	${\it defun\ getAbbreviation\ .\ .\ .\ .\ .\ .\ .}$						277
	6.5.40	defun mkAbbrev						278
	6.5.41	defun addSuffix		 	 	 		278
		defun alistSize						279
		defun get Signature From Mode		 	 	 		279
	6544	defun get Special Case Assoc						280

	defun addArgumentConditions	
6.5.46	defun stripOffSubdomainConditions	281
6.5.47	defun stripOffArgumentConditions	281
6.5.48	defun getSignature	282
6.5.49	defun checkAndDeclare	283
6.5.50	defun hasSigInTargetCategory	284
6.5.51	defun getArgumentMode	285
6.5.52	defplist compElt plist	285
	defun compElt	
	defplist compExit plist	
6.5.55	defun compExit	286
	defplist compHas plist	
	defun compHas	
	defun compHasFormat	
	defun mkList	
6.5.60	defplist compIf plist	289
	defun complf	
	defun compFromIf	
	defun canReturn	
	defun compBoolean	
	defun getSuccessEnvironment	
	defun getInverseEnvironment	
	defun getUnionMode	
	defun isUnionMode	
	defplist compImport plist	
	defun compImport	
	defplist compls plist	
	defun compls	
	defplist compJoin plist	
	defun compJoin	
	defun compForMode	
	defplist compLambda plist	
	defun compLambda	
	defplist compLeave plist	
	defun compLeave	
	defplist compMacro plist	
	defun compMacro	
	defplist compPretend plist	
	defun compPretend	
	defplist compQuote plist	
	defun compQuote	
	defplist compReduce plist	
	defun compReduce	
	defun compReduce1	
	defplist compRepeatOrCollect plist	
	defplist compRepeatOrCollect plist	
	* * *	

	6.5.91 defun compRepeatOrCollect
	6.5.92 defplist compReturn plist
	6.5.93 defun compReturn
	6.5.94 defplist compSeq plist
	6.5.95 defun compSeq
	6.5.96 defun compSeq1
	6.5.97 defun replaceExitEtc
	6.5.98 defun convertOrCroak
	6.5.99 defun compSeqItem
	6.5.100 defplist compSetq plist
	6.5.101 defplist compSetq plist
	6.5.102 defun compSetq
	6.5.103 defun compSetq1
	6.5.104 defun uncons
	6.5.105 defun setqMultiple
	6.5.106 defun setqMultipleExplicit
	6.5.107 defun setqSetelt
	6.5.108 defun setqSingle
	6.5.109 defun NRTassocIndex
	6.5.110 defun assignError
	6.5.111 defun outputComp
	6.5.112 defun maxSuperType
	6.5.113 defun isDomainForm
	6.5.114 defun isDomainConstructorForm
	6.5.115 defplist compString plist
	6.5.116 defun compString
	6.5.117 defplist compSubDomain plist
	6.5.118 defun compSubDomain
	6.5.119 defun compSubDomain1
	6.5.120 defun lispize
	6.5.121 defplist compSubsetCategory plist
	6.5.122 defun compSubsetCategory
	6.5.123 defplist compSuchthat plist
	6.5.124 defun compSuchthat
	6.5.125 defplist compVector plist
	6.5.126 defun compVector
	6.5.127 defplist compWhere plist
	6.5.128 defun compWhere
6.6	Functions for coercion
0.0	6.6.1 defun coerce
	6.6.2 defun coerceEasy
	6.6.3 defun coerceSubset
	6.6.4 defun coerceHard
	6.6.5 defun coerceExtraHard
	V I
	6.6.7 defun coerceable

159
1

		6.6.8	defun coerceExit
		6.6.9	defplist compAtSign plist
		6.6.10	defun compAtSign
		6.6.11	defplist compCoerce plist
		6.6.12	defun compCoerce
		6.6.13	defun compCoerce1
		6.6.14	defun coerceByModemap
		6.6.15	defun autoCoerceByModemap
		6.6.16	defun resolve
		6.6.17	defun mkUnion
		6.6.18	defun This orders Unions $\dots \dots \dots$
		6.6.19	defun mode Equal Subst
_	_		
7			sformers 337
	7.1		called postparse routines
		7.1.1	defun postTransform
		7.1.2	defun postTran
		7.1.3	defun postOp
		7.1.4	defun postAtom
		7.1.5	defun postTranList
		7.1.6	defun postScriptsForm
		7.1.7	defun postTranScripts
		7.1.8	defun postTransformCheck
		7.1.9	defun postcheck
		7.1.10	defun postError
		7.1.11	defun postForm
	7.2	Indirec	et called postparse routines
		7.2.1	defplist postAdd plist
		7.2.2	defun postAdd
		7.2.3	defun postCapsule
		7.2.4	defun postBlockItemList
		7.2.5	defun postBlockItem
		7.2.6	defplist postAtSign plist
		7.2.7	defun postAtSign
		7.2.8	defun postType
		7.2.9	defplist postBigFloat plist
		7.2.10	defun postBigFloat
		7.2.11	defplist postBlock plist
			defun postBlock
			defplist postCategory plist
			defun postCategory
			defun postCollect,finish
			defun postMakeCons
			defplist postCollect plist
			defun postCollect
			defun postIteratorList
		1.2.13	detail positionalist

	defplist postColon plist	
7.2.21	defun postColon	
7.2.22	defplist postColonColon plist	351
7.2.23	defun postColonColon	351
7.2.24	defplist postComma plist	352
7.2.25	defun postComma	352
7.2.26	defun comma2Tuple	352
7.2.27	defun postFlatten	352
7.2.28	defplist postConstruct plist	353
7.2.29	defun postConstruct	353
7.2.30	defun postTranSegment	354
7.2.31	defplist postDef plist	354
7.2.32	defun postDef	354
7.2.33	defun postDefArgs	355
7.2.34	defplist postExit plist	356
7.2.35	defun postExit	356
7.2.36	defplist postIf plist	356
7.2.37	defun postIf	356
7.2.38		
7.2.39	defun postin	357
7.2.40	defun postInSeq	357
7.2.41	defplist postIn plist	358
7.2.42	defun postIn	358
7.2.43	defplist postJoin plist	358
7.2.44	defun postJoin	358
7.2.45	defplist postMapping plist	359
7.2.46	defun postMapping	359
7.2.47	defplist postMDef plist	359
7.2.48	defun postMDef	360
7.2.49	defplist postPretend plist	
7.2.50	defun postPretend	361
7.2.51	defplist postQUOTE plist	
7.2.52	defun postQUOTE	361
7.2.53	defplist postReduce plist	
7.2.54	defun postReduce	
7.2.55	defplist postRepeat plist	
7.2.56	defun postRepeat	
7.2.57	defplist postScripts plist	362
7.2.58	defun postScripts	363
7.2.59	defplist postSemiColon plist	
7.2.60	defun postSemiColon	
7.2.61	defun postFlattenLeft	
7.2.62	defplist postSignature plist	
7.2.63	defun postSignature	
7.2.64	defun removeSuperfluousMapping	
7.2.65	defun killColons	365

CONTENTS	161

		7.2.66	defplist postSlash plist	365
			defun postSlash	
			defplist postTuple plist	
			defun postTuple	
			defplist postTupleCollect plist	
			defun postTupleCollect	
			defplist postWhere plist	
			defun postWhere	
			defplist postWith plist	
			defun postWith	
	7.3		rt routines	
	1.0	7.3.1	defun setDefOp	
		7.3.2	defun aplTran	
		7.3.2	defun aplTran1	
		7.3.4	defun aplTranList	
		7.3.4	defun hasAplExtension	
		7.3.6	defun deepestExpression	
		7.3.7	defun containsBang	
		7.3.8	defun getScriptName	
		7.3.9	defun decodeScripts	
		1.0.3	defail decodescripts	312
8	DEI	F form	s	373
			defvar \$defstack	
			defvar \$is-spill	
			defvar \$is-spill-list	
			defvar \$vl	
			defvar \$is-gensymlist	
			defvar initial-gensym	
			defvar \$is-eqlist	
			defun hackforis	
			defun hackforis1	
			defun unTuple	
	8.1		ARSE code	
	0.1	8.1.1	defvar tmptok	
		8.1.2	defvar tok	
		8.1.3	defvar ParseMode	
		8.1.4	defvar definition-name	
		8.1.5		
		8.1.6	defun PARSE-NewExpr	
		8.1.7	defun PARSE-Command	
		8.1.8	defun PARSE-SpecialKeyWord	
		8.1.9	defun PARSE-SpecialCommand	
			defun PARSE-TokenCommandTail	
			defun PARSE-TokenOption	
			defun PARSE-TokenOption	
		0.1.13	defun PARSE-CommandTail	. 379

8.1.14	defun PARSE-PrimaryOrQM	379
8.1.15	defun PARSE-Option	380
8.1.16	defun PARSE-Statement	380
8.1.17	defun PARSE-InfixWith	381
8.1.18	defun PARSE-With	381
8.1.19	defun PARSE-Category	381
8.1.20	defun PARSE-Expression	382
8.1.21	defun PARSE-Import	383
8.1.22	defun PARSE-Expr	383
8.1.23	defun PARSE-LedPart	384
8.1.24	defun PARSE-NudPart	384
8.1.25	defun PARSE-Operation	384
8.1.26	defun PARSE-leftBindingPowerOf	385
	defun PARSE-rightBindingPowerOf	
8.1.28	defun PARSE-getSemanticForm	385
8.1.29	defun PARSE-Prefix	386
8.1.30		
8.1.31	defun PARSE-TokTail	
	defun PARSE-Qualification	
	defun PARSE-Reduction	
	defun PARSE-ReductionOp	
	defun PARSE-Form	
	defun PARSE-Application	
8.1.37	**	
8.1.38	defun PARSE-Selector	
	· ·	391
	· ·	391
	· ·	392
8.1.43		
8.1.44	defun PARSE-FloatBasePart	
8.1.45		
8.1.46		
8.1.47		
8.1.48	<u> </u>	
8.1.49		
8.1.50		
8.1.51	defun PARSE-String	
8.1.52		396
8.1.53	defun PARSE-Scripts	396
8.1.54	1	396
8.1.55	defun PARSE-Name	397
8.1.56	defun PARSE-Data	397
8.1.57		397
	defun PARSE-Sexpr1	398
	defun PARSE-NBGliphTok	399

CONTENTS	163

	8.1.60	defun PARSE-GliphTok
		defun PARSE-AnyId
	8.1.62	defun PARSE-Sequence
	8.1.63	defun PARSE-Sequence1
	8.1.64	defun PARSE-OpenBracket
		defun PARSE-OpenBrace
	8.1.66	defun PARSE-IteratorTail
	8.1.67	defun PARSE-Iterator
	8.1.68	The PARSE implicit routines
		defun PARSE-Suffix
	8.1.70	defun PARSE-SemiColon
	8.1.71	defun PARSE-Return
	8.1.72	defun PARSE-Exit
	8.1.73	defun PARSE-Leave
	8.1.74	defun PARSE-Seg
	8.1.75	defun PARSE-Conditional
	8.1.76	defun PARSE-ElseClause
	8.1.77	defun PARSE-Loop
	8.1.78	defun PARSE-LabelExpr
	8.1.79	defun PARSE-FloatTok
8.2	The P.	ARSE support routines
	8.2.1	String grabbing
	8.2.2	defun match-string
	8.2.3	defun skip-blanks
	8.2.4	defun token-lookahead-type
	8.2.5	defun match-advance-string
	8.2.6	defun initial-substring-p
	8.2.7	defun quote-if-string
	8.2.8	defun escape-keywords
	8.2.9	defun isTokenDelimiter
	8.2.10	defun underscore
	8.2.11	Token Handling
		defun getToken
	8.2.13	defun unget-tokens
	8.2.14	defun match-current-token
	8.2.15	defun match-token
	8.2.16	defun match-next-token
	8.2.17	defun current-symbol
	8.2.18	defun make-symbol-of
	8.2.19	defun current-token
	8.2.20	defun try-get-token
		defun next-token
		defun advance-token
	8.2.23	defvar XTokenReader
		defun get-token
	8.2.25	Character handling

		8.2.26 defun current-char	416
		8.2.27 defun next-char	416
		8.2.28 defun char-eq	417
		8.2.29 defun char-ne	417
		8.2.30 Error handling	417
		8.2.31 defvar meta-error-handler	417
		8.2.32 defun meta-syntax-error	417
		8.2.33 Floating Point Support	
		8.2.34 defun floatexpid	
		8.2.35 Dollar Translation	418
		8.2.36 defun dollarTran	418
		8.2.37 Applying metagrammatical elements of a production (e.g., Star)	418
		8.2.38 defmacro Bang	
		8.2.39 defmacro must	
		8.2.40 defun action	
		8.2.41 defun optional	
		8.2.42 defmacro star	
		8.2.43 Stacking and retrieving reductions of rules	
		8.2.44 defvar reduce-stack	
		8.2.45 defmacro reduce-stack-clear	
		8.2.46 defun push-reduction	
		r and	
9	Con	ment Recording	123
	9.1	Comment Recording Layer 0 – API	
		9.1.1 defun recordSignatureDocumentation	424
		9.1.2 defun recordAttributeDocumentation	
	9.2	Comment Recording Layer 1	424
		9.2.1 defun recordDocumentation	
	9.3	Comment Recording Layer 2	425
		9.3.1 defun collectComBlock	425
	9.4	Comment Recording Layer 3	425
		9.4.1 defun recordHeaderDocumentation	425
		9.4.2 defun collectAndDeleteAssoc	426
10) Cate	gory handling	127
		10.0.3 defun getConstructorExports	427
11	D:1	ling libdb.text	120
11	. Dull	11.0.4 defun extendLocalLibdb	129
		11.0.5 defun buildLibdb	
			430
		11.0.6 defun buildLibdbString	432
		11.0.7 defun dbReadLines	432
		11.0.8 defun purgeNewConstructorLines	432
		11.0.9 defun dbWriteLines	433
		11.0.10 defun buildLibdbConEntry	
		11.0.11 defun buildLibOps	 435

65
6

	11.0.12 defun buildLibOp
	11.0.13 defun buildLibAttrs
	11.0.14 defun buildLibAttr
	$11.0.15 defun\ screen Local Line\ \dots \ \dots$
19 Com	nment Syntax Checking 439
	nment Syntax Checking Comment Checking Layer 0 – API
12.1	12.1.1 defun finalizeDocumentation
19 9	Comment Checking Layer 1
12.2	12.2.1 defun transDocList
19.3	Comment Checking Layer 2
12.0	12.3.1 defun transDoc
19 4	Comment Checking Layer 3
12.4	12.4.1 defun transformAndRecheckComments
19.5	Comment Checking Layer 4
12.0	12.5.1 defun checkComments
	12.5.2 defun checkRewrite
12.6	Comment Checking Layer 5
12.0	12.6.1 defun checkArguments
	12.6.2 defun checkBalance
12.7	Comment Checking Layer 6
12.1	12.7.1 defun checkBeginEnd
	12.7.2 defun checkDecorate
	12.7.3 defun checkDecorateForHt
	12.7.4 defun checkDocError1
	12.7.5 defun checkFixCommonProblem
	12.7.6 defun checkGetLispFunctionName
	12.7.7 defun checkHTargs
	12.7.8 defun checkRecordHash
	12.7.9 defun spadSysChoose
	12.7.10 defun spadSysBranch
	12.7.11 defun checkTexht
	12.7.12 defun checkTransformFirsts
	12.7.13 defun checkTrim
12.8	Comment Checking Layer 7
	12.8.1 defun checkDocError
	12.8.2 defun checkRemoveComments
	12.8.3 defun checkSkipToken
	12.8.4 defun checkSplit2Words
12.9	Comment Checking Layer 8
	12.9.1 defun checkAddIndented
	12.9.2 defun checkDocMessage
	12.9.3 defun checkExtract
	12.9.4 defun checkGetArgs
	12.9.5 defun checkGetMargin
	12.9.6 defun checkGetParse

		checkGetStringBeforeRightBrace	
		checkIeEg	
	12.9.9 defun	checkIndentedLines	473
	$12.9.10\mathrm{defun}$	checkSkipIdentifierToken	474
	$12.9.11\deg un$	checkSkipOpToken	474
		checkSplitBrace	
		checkTrimCommented	
	12.9.14 defun	newString2Words	475
12.10		necking Layer 9	
		checkAddBackSlashes	
	12.10.2 defun	checkAddMacros	477
		checkAddPeriod	
		checkAddSpaceSegments	
		checkAddSpaces	
		checkAlphabetic	
		checkIeEgfun	
		checkIsValidType	
		checkLookForLeftBrace	
		checkLookForRightBrace	
		checkNumOfArgs	
		checkSayBracket	
		checkSkipBlanks	
		checkSplitBackslash	
		checkSplitOn	
		checkSplitPunctuation	
	$12.10.17 \\ lefun$	firstNonBlankPosition	485
	12.10.18lefun	getMatchingRightPren	485
	$12.10.1 {\tt Mefun}$	hasNoVowels	486
	$12.10.2 \\ \texttt{@lefun}$	htcharPosition	486
	$12.10.21 \mathrm{lefun}$	newWordFrom	487
	$12.10.22 \mathrm{lefun}$	removeBackslashes	487
	$12.10.23 \mathrm{lefun}$	whoOwns	488
13 Utili	ity Function		189
		translabel	
		translabel1	
		displayPreCompilationErrors	
		1	490
		The second secon	491
		r r	491
		1 0	492
		1	492
			492
			493
		The state of the s	493
	13 0 35 dofun	parco argument designator	102

CONTENTS	167

	13.0.36 defun checkWarning	94
	13.0.37 defun tuple2List	94
	13.0.38 defmacro pop-stack-1	95
	13.0.39 defmacro pop-stack-2	95
	13.0.40 defmacro pop-stack-3	95
	13.0.41 defmacro pop-stack-4	96
	13.0.42 defmacro nth-stack	96
	13.0.43 defun Pop-Reduction	96
	13.0.44 defun addclose	96
	13.0.45 defun blankp	97
	13.0.46 defun drop	97
	13.0.47 defun escaped	97
	13.0.48 defvar \$comblocklist	98
	13.0.49 defun fincomblock	98
	13.0.50 defun indent-pos	98
	13.0.51 defun infixtok	99
	13.0.52 defun is-console	99
	13.0.53 defun next-tab-loc	99
	13.0.54 defun nonblankloc	00
	13.0.55 defun parseprint	00
	13.0.56 defun skip-to-endif	00
14 Th		01
	14.0.57 defvar \$newConlist	
	Compiling EQ.spad	
14.2	2 The top level compiler command	
	14.2.1 defun compiler	
	14.2.2 defun compileSpad2Cmd	
	14.2.3 defun compileSpadLispCmd	
	14.2.4 compilerDoitWithScreenedLisplib	
	14.2.5 defun compilerDoit	12
	14.2.6 defun /rq	
	14.2.6 defun /rq	13
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5	13 13
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5	13 13 14
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5	13 13 14 15
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5	13 14 15 17
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5	13 14 15 17
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5	13 14 15 17
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5 14.2.14 defun def-rename 5	13 14 15 17 26
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5 14.2.14 defun def-rename 5 14.2.15 defun compOrCroak 5	13 14 15 17 26 27
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5 14.2.14 defun def-rename 5 14.2.15 defun compOrCroak 5 14.2.16 defun compOrCroak1 5	13 14 15 17 26 27
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5 14.2.14 defun def-rename 5 14.2.15 defun compOrCroak 5 14.2.16 defun compOrCroak1 5 14.2.17 defun comp 5	13 14 15 17 26 27 27 28
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5 14.2.14 defun def-rename 5 14.2.15 defun compOrCroak 5 14.2.16 defun compOrCroak1 5 14.2.17 defun comp 5 14.2.18 defun compNoStacking 5	13 14 15 17 26 27 27 28 29
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5 14.2.14 defun def-rename 5 14.2.15 defun compOrCroak 5 14.2.16 defun compOrCroak1 5 14.2.17 defun comp 5 14.2.18 defun compNoStacking 5 14.2.19 defun compNoStacking1 5	13 14 15 17 26 27 28 29 30 31
	14.2.6 defun /rq 5 14.2.7 defun /rf 5 14.2.8 defun /RQ,LIB 5 14.2.9 defun /rf-1 5 14.2.10 defun spad 5 14.2.11 defun Interpreter interface to the compiler 5 14.2.12 defun compTopLevel 5 14.2.13 defun print-defun 5 14.2.14 defun def-rename 5 14.2.15 defun compOrCroak 5 14.2.16 defun compOrCroak1 5 14.2.17 defun comp 5 14.2.18 defun compNoStacking 5	13 14 15 17 26 27 28 29 30 30 31

14.2.21 defun comp3	
14.2.22 defun applyMapping	533
14.2.23 defun compApply	
$14.2.24 defun compTypeOf \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$	
14.2.25 defun compColonInside	536
14.2.26 defun compAtom	536
14.2.27 defun compAtomWithModemap	537
14.2.28 defun transImplementation	538
14.2.29 defun convert	538
14.2.30 defun primitiveType	539
14.2.31 defun compSymbol	
14.2.32 defun compList	540
14.2.33 defun compForm	541
14.2.34 defun compForm1	541
$14.2.35 defun compToApply \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	543
14.2.36 defun compApplication	544
$14.2.37\mathrm{defun}\mathrm{getFormModemaps}\ldots\qquad\ldots\qquad\ldots\qquad\ldots$	545
$14.2.38\mathrm{defun}\mathrm{eltModemapFilter}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	546
14.2.39 defun seteltModemapFilter	
14.2.40 defun compExpressionList	547
14.2.41 defun compForm2	548
14.2.42 defun compForm3	550
$14.2.43\mathrm{defun}\mathrm{compFocompFormWithModemap}\ldots\qquad\ldots\qquad\ldots$	550
14.2.44 defun substituteIntoFunctorModemap	552
14.2.45 defun compFormPartiallyBottomUp	552
14.2.46 defun compFormMatch	553
14.2.47 defun compUniquely	553
14.2.48 defun compArgumentsAndTryAgain	
14.2.49 defun compWithMappingMode	554
$14.2.50 \mathrm{defun} \mathrm{compWithMappingMode1} \ldots \ldots \ldots \ldots \ldots \ldots$	554
$14.2.51\mathrm{defun}\mathrm{extractCodeAndConstructTriple}\ldots\ldots\ldots\ldots\ldots.$	559
14.2.52 defun hasFormalMapVariable	560
14.2.53 defun argsToSig	560
14.2.54 defun compMakeDeclaration	561
$14.2.55\mathrm{defun\ modifyModeStack}\ \dots$	561
14.2.56 defun Create a list of unbound symbols	562
14.2.57 defun compOrCroak1, compactify	563
14.2.58 defun Compiler/Interpreter interface	563
14.2.59 defun recompile-lib-file-if-necessary	
14.2.60 defun spad-fixed-arg	564
14.2.61 defun compile-lib-file	564
14.2.62 defun compileFileQuietly	564
14.2.63 defvar \$byConstructors	565
$14.2.64\mathrm{defvar}\$\mathrm{constructorsSeen}\ldots\ldots\ldots\ldots\ldots\ldots\ldots$	565

CONTENTS	169
15 Level 1 $15.0.65$ defvar current-fragment $15.0.66$ defun read-a-line	
16 The Chunks	569
Signatures	583
Bibliography	585
Index	587

Volume 10: Axiom Algebra: Implementation

1	The		ra Makefile 1
	1.1		g new algebra
	1.2	Adding	g the algebra to the proper book
		1.2.1	Adding a Category
		1.2.2	Adding a Domain
		1.2.3	Adding a Package
		1.2.4	Adding Numerics
	1.3	Rebuil	ding the algebra from scratch
	1.4	The A	lgebra Lattice Layers
		1.4.1	Layer 0 Bootstrap
		1.4.2	Layer 0
		1.4.3	Layer 1
		1.4.4	Layer 2
		1.4.5	Layer 3
		1.4.6	Layer 4
		1.4.7	Layer 5
		1.4.8	Layer6
		1.4.9	Layer7
		1.4.10	Layer8
		1.4.11	Layer9
		1.4.12	Layer10
		1.4.13	Layer11
		1.4.14	Layer12
		1.4.15	Layer13
		1.4.16	Layer14
		1.4.17	Layer15
		1.4.18	Layer16
		1.4.19	Layer17
		1.4.20	Layer18
		1.4.21	Layer19
		1.4.22	Layer20
		1.4.23	Layer21
		1.4.24	Layer22
		1.4.25	Layer23
		1.4.26	Order
	1.5	Clique	s
	1.6	Broker	n Files
	1.7	The E	nvironment
		1.7.1	The working directories
		1.7.2	The depsys variable
		1.7.3	The interpsys variable
		1.7.4	The shell variable
	1.0	CD1 3.4	1 (1 (4 (4

CONTENTS	171
----------	-----

1.9	Generic Make Rules
1.10	Pamphlet file structure
	1.10.1 Finding the algebra code
	1.10.2 Write the Makefile stanzas for the algebra files
	1.10.3 Find the algebra bootstrap code
	1.10.4 Write the Makefile stanzas for the bootstrap files
1.11	1 Stage markers
	1.11.1 Regression testing
1.12	2 The Makefile
Alg	gebra Background 36
2.1	How NAG Libraries were used
2.2	Algebraic Function Fields and Algebraic Geometry
	2.2.1 The Genus of a Plane Curve
	2.2.2 Algebraic Curves with PAFF
	2.2.3 Algebraic Curves with PAFFFF
2.3	Groebner Basis
	2.3.1 How To Compute A Groebner Basis
	2.3.2 Monomial Ordering
	2.3.3 Variable Ordering
	2.3.4 Combined Ordering
	2.3.5 An Example Computation
2.4	Elementary Functions
	2.4.1 Rationale for Branch Cuts and Identities
	2.4.2 Inverse trigonometric functions
	2.4.3 Inverse hyperbolic functions
	V

Volume 10.1: Axiom Algebra: Theory

1	Inte	rval A	rithmetic 1
	1.1	Additi	on
	1.2		Shange
	1.3	Subtra	action
	1.4		blication
	1.5	Multip	dication by a positive number
	1.6	Multip	olication of Two Positive Numbers
	1.7		on
	1.8	_	ocal
	1.9		ite Value
		-	
	1.11	Square	e Root
2	Inte	gratio	$_{ m n}$
	2.1	Ration	nal Functions
		2.1.1	The full partial-fraction algorithm
		2.1.2	The Hermite reduction
		2.1.3	The Rothstein-Trager and Lazard-Rioboo-Trager algorithms 8
	2.2	Algebr	raic Functions
		2.2.1	The Hermite reduction
		2.2.2	Simple radical extensions
		2.2.3	Liouville's Theorem
		2.2.4	The integral part
		2.2.5	The logarithmic part
	2.3	Eleme	ntary Functions
		2.3.1	Differential algebra
		2.3.2	The Hermite reduction
		2.3.3	The polynomial reduction
		2.3.4	The residue criterion
		2.3.5	The transcendental logarithmic case
		2.3.6	The transcendental exponential case
		2.3.7	The transcendental tangent case
		2.3.8	The algebraic logarithmic case
		2.3.9	The algebraic exponential case
3	Sing	gular V	Value Decomposition 31
	3.1	Singul	ar Value Decomposition Tutorial
4	Qua	ternio	$_{ m ns}$ 37
_	Pref		37
	4.1		rnions
	4.2	-	s, and their Composition
			oles To Chapter 1

CONTENTS	173
----------	-----

	4.4	Produ	ets And Quotients of Vectors
	4.5	Examp	bles To Chapter 2
	4.6	Interp	retations And Transformations
	4.7	Examp	bles to Chapter 3
	4.8	Axiom	Examples
5	Clif	rand A	lgebra 12
Э	5.1	ford A	uction
	$5.1 \\ 5.2$		d Basis Matrix Theory
	5.2 5.3		ation of the inverse of a Clifford number
	5.5	5.3.1	Example 1: Clifford (2)
		5.3.1	Example 2: Clifford (3)
		5.3.3	Example 3: Clifford (2,2)
		5.3.4	Conclusion
		0.3.4	Conclusion
6	Pac	kage fo	r Algebraic Function Fields 13
7	Inte	rpolat	ion Formulas 13'
		_	
8		e Syst	
	8.1		e
		8.1.1	Terminology
		8.1.2	General Notation
		8.1.3	Partial Orders and Quasi-Lattices
		8.1.4	Order-Sorted Algebras
		8.1.5	Category Theory
	0.0	8.1.6	The Type System of Axiom
	8.2		Classes
		8.2.1	Types as Terms of an Order-Sorted Signature
		8.2.2	Type Inference
		8.2.3	Complexity of Type Inference
		8.2.4	Algebraic Specifications of Type Classes
		8.2.5	Parameterized Type Classes
	0.9	8.2.6	Type Classes as First-Order Types
	8.3		ons
		8.3.1	General Remarks
		8.3.2	Coherence
		8.3.3	Type Isomorphisms
		8.3.4	A Type Coercion Problem
		8.3.5	Properties of the Coercion Preorder
		8.3.6	Combining Type Classes and Coercions
	0.4	8.3.7	Type Inference
	8.4		Typing Constructs
		8.4.1	Partial Functions
		8.4.2	Types Depending on Elements

9	Typ	e Systems 2 21	
		9.0.3 Object in Computer Algebra	4
		9.0.4 Multiple Representations	.5
		9.0.5 Domains and Categories	7
		9.0.6 Domain Sharing	21
		9.0.7 Packages and Categories	22
		9.0.8 Parameterization	23
		9.0.9 Subtyping of Domains	0
		9.0.10 Type Classes	3
		9.0.11 Comparison with Related Work	6
		9.0.12 Conclusions	8
10		e's Coercion Algorithm 24	
	10.1	Introduction	
		10.1.1 Abstract Datatypes in General	
		10.1.2 The Problem	
		10.1.3 Examples of how Axiom coerces	
		10.1.12 Mathematical solution overview	
		10.1.13 Constructing coercions algorithmically	
	10.2	Types in Computer Algebra	
		10.2.1 Introduction	
	10.3	Category Theory	8
		10.3.1 About Category Theory	8
		10.3.17 Categories and Axiom	1
		10.3.19 Functors and Axiom	2
		10.3.20 Coercion and category theory	
		10.3.21 Conclusion	2
	10.4	Order sorted algebra	2
		10.4.1 Universal Algebra	3
		10.4.13 Term Algebras	5
		10.4.16 Order-sorted algebras	5
		10.4.24 Extension of signatures	7
		10.4.28 The equational calculus	8
		10.4.48 Signatures, theories, varieties, and Axiom	i1
		10.4.49 Conclusion	i2
	10.5	Extending order sorted algebra	i2
		10.5.1 Partial Functions	3
		10.5.10 Conditional varieties	6
		10.5.22 A Category theory approach	0
		10.5.23 Coercion	0
		10.5.26 Conclusion	2
	10.6	Coherence	2
		10.6.1 Weber's work I: definitions	2
		10.6.10 Weber's work II: Assumptions and a conjecture	' 5
		10.6.18 The coherence theorem	7
		10.6.26 Extending the coherence theorem	37

CONTENTS	17	7;	
ONIDIVID	т,		

		10.6.31 Conclusion	290
	10.7	The automated coercion algorithm	
		10.7.1 Finitely generated algebras	
		10.7.5 Constructibility	
		10.7.10 The algorithm	
		10.7.12 Existence of the coercion	
		10.7.13 Proving homomorphicity and coerciveness	
		10.7.22 Conclusion	
	10.8	Implementation Details	
		10.8.1 Labelling operstors	
		10.8.2 Getting information from domains	
		10.8.3 Checking information from domains	
		10.8.4 Flaws in the implementation	
		10.8.5 Conclusion	
	10.9	Making Axiom algebraically correct	
		10.9.1 Explicitly defined theories	
		10.9.2 Operator symbols and names	
		10.9.3 Moving certain operators	
		10.9.4 Retyping certain sorts	
		10.9.5 Sorts and their order	
		10.9.6 Altering Axiom's databases	
		10.9.7 Conclusion	
	10.10	OConclusions	
	10.1	10.10.1 Summary	
		10.10.2 Future work and extensions	
11	Sym	metries of Partial Differential Equations 3	3 13
	11.1	Symmetries of Differential Equations and the Scratchpad Package SPDE :	313
10	ъ.		
12		1	319
		Rabin revisited	
		Non-square-free numbers	
		Jaeschke analysed	
		Roots of -1	
		The "maximial 2-part" test	
		How would one defeat these modifications?	
		Leech's attack	
		The $(K+1) \cdot (2K+1)$ attack	
	12.9	Conclusions	329
13	Fini	te Fields in Axiom (Grabmeier/Scheerhorn) 3	333
19		· · · · · · · · · · · · · · · · · · ·	334
		Categories for finite field domains	
		General finite field functions	
	10.0	13.3.1 E as an algebra of rank n over F	
		10.0.1 2 00 011 0160010 01 101111 1/ 0/01 1	
		13.3.2 The $F[X]$ -module structure of E	338

	13.3.3 The cyclic group E^*	339	9
	13.3.4 Discrete logarithm		
	13.3.5 Elements of maximal order	340	Э
	13.3.6 Enumeration of elements of E	34	1
	13.3.7 Conversion between elements of the field and its groundfield	34	1
13.4	4 Prime field		
	13.4.1 Extension Constructors of Finite Fields		
13.	5 Polynomial basis representation		
	6 Cyclic group representation		
	13.6.1 Operations of multiplicative nature		
	13.6.2 Addition and Zech logarithm		
	13.6.3 Time expensive operations		
13.	7 Normal basis representation		
	13.7.1 Operations of additive nature		
	13.7.2 Multiplication and normal basis complexity		
	13.7.3 Norm and multiplicative inverse		
	13.7.4 Exponentiation		
13 3	8 Homomorphisms between finite fields		
10.	13.8.1 Basis change between normal and polynomial basis representation		
	13.8.2 Conversion between different extensions		
13 9	9 Polynomials over finite fields		
10.	13.9.1 Root finding		
	13.9.2 Polynomials with certain properties		
	13.9.3 Testing whether a polynomial is of a given kind		
	13.9.4 Searching the next polynomial of a given kind		
	13.9.5 Creating polynomials		
	13.9.6 Number of polynomials of a given kind and degree		
	13.9.7 Some other functions concerning polynomials		
13	10Future directions		
	11Comparison of computation times between different representations		
10.	13.11.1 The extension fields $GF(5^4)$ over $GF(5)$ and $GF(2^{10})$ over $GF(2)$	359	3
	13.11.2 Different extensions of $GF(5^{21})$ over $GF(5)$	350	a
13	12Dependencies between the constructors	360	ì
10.	12Dependencies between the constitutions	000	,
14 Re	eal Quantifier Elimination	361	L
	1 Overview	36	1
14.5	2 General Methods	365	2
	14.2.1 The First Method	365	2
	14.2.2 Cylindrical Algebraic Decomposition Method	360	3
	14.2.3 Quantifier-Block Elimination Methods		
14.3	3 Special Methods		
	14.3.1 Low Degrees		
	14.3.2 Constrained by Quadratic Equation		
	14.3.3 Single Atomic Formula		
14.	4 Approximate Methods		
	14.4.1 Generic Quantifier Elimination		

CONTENTS	177
14.4.2 Volume Approximate Quantifier Elimination	391
15 Potential Future Algebra	401
16 Groebner Basis	403
17 Greatest Common Divisor	405
18 Polynomial Factorization	407
19 Differential Forms 19.1 From differentials to differential forms 19.1.1 The wedge product	410 413
20 Pade approximant	417
21 Schwartz-Zippel lemma	419
22 Chinese Remainder Theorem	421
23 Gaussian Elimination	423
24 Diophantine Equations	425
Bibliography	427
Index	497

Volume 10.2: Axiom Algebra: Categories

1	Categories	
2	Category 1	Layer 1 3
	2.0.1	Category (CATEGORY)
	2.0.2	AdditiveValuationAttribute (ATADDVA)
	2.0.3	ApproximateAttribute (ATAPPRO)
	2.0.4	ArbitraryExponentAttribute (ATARBEX)
	2.0.5	ArbitraryPrecisionAttribute (ATARBPR)
	2.0.6	ArcHyperbolicFunctionCategory (AHYP)
	2.0.7	ArcTrigonometricFunctionCategory (ATRIG)
	2.0.8	AttributeRegistry (ATTREG)
	2.0.9	BasicType (BASTYPE)
	2.0.10	CanonicalAttribute (ATCANON)
	2.0.11	CanonicalClosedAttribute (ATCANCL)
	2.0.12	CanonicalUnitNormalAttribute (ATCUNOR)
	2.0.13	CentralAttribute (ATCENRL)
		CoercibleTo (KOERCE)
	2.0.15	CombinatorialFunctionCategory (CFCAT)
	2.0.16	CommutativeStarAttribute (ATCS)
		Convertible To (KONVERT)
		ElementaryFunctionCategory (ELEMFUN) 51
		Eltable (ELTAB)
	2.0.20	FiniteAggregateAttribute (ATFINAG)
		HyperbolicFunctionCategory (HYPCAT)
		InnerEvalable (IEVALAB)
	2.0.23	JacobiIdentityAttribute (ATJACID)
	2.0.24	LazyRepresentationAttribute (ATLR)
	2.0.25	LeftUnitaryAttribute (ATLUNIT)
		Modular Algebraic Gcd Operations (MAGCDOC)
	2.0.27	MultiplicativeValuationAttribute (ATMULVA)
	2.0.28	NotherianAttribute (ATNOTHR)
	2.0.29	NoZeroDivisorsAttribute (ATNZDIV)
	2.0.30	NullSquareAttribute (ATNULSQ)
	2.0.31	OpenMath (OM)
	2.0.32	PartiallyOrderedSetAttribute (ATPOSET) 91
		PartialTranscendentalFunctions (PTRANFN)
	2.0.34	Patternable (PATAB)
	2.0.35	PrimitiveFunctionCategory (PRIMCAT)
		RadicalCategory (RADCAT)
	2.0.37	RetractableTo (RETRACT)
		RightUnitaryAttribute (ATRUNIT)
	2.0.39	ShallowlyMutableAttribute (ATSHMUT)
	2.0.40	SpecialFunctionCategory (SPFCAT)

CONTENTS	179
----------	-----

		$\label{thm:tigonometric} {\it Trigonometric Function Category} \ ({\it TRIGCAT}) \ \dots \ \dots \ .$			
		Type (TYPE)			
	2.0.43	UnitsKnownAttribute (ATUNIKN)	 	 •	130
3	Category	Layer 2			133
		Aggregate (AGG)	 		133
		CombinatorialOpsCategory (COMBOPC)			
		Comparable (COMPAR)			
		EltableAggregate (ELTÁGG)			
		Evalable (EVALAB)			
	3.0.49	FortranProgramCategory (FORTCAT)	 		155
		FullyRetractableTo (FRETRCT)			
		FullyPatternMatchable (FPATMAB)			
		Logic (LOGIC)			
		PlottablePlaneCurveCategory (PPCURVE)			
		PlottableSpaceCurveCategory (PSCURVE)			
		RealConstant (REAL)			
		SegmentCategory (SEGCAT)			
		SetCategory (SETCAT)			
		TranscendentalFunctionCategory (TRANFUN)			
	C 4				001
4					201
		AbelianSemiGroup (ABELSG)			
		BlowUpMethodCategory (BLMETCT)			
		DesingTreeCategory (DSTRCAT)			
		FortranFunctionCategory (FORTFN)			
		FortranMatrixCategory (FMC)			
		FortranMatrixFunctionCategory (FMFUN)			
		FortranVectorCategory (FVC)			
		Fortran Vector Function Category (FVFUN)			
		FullyEvalableOver (FEVALAB)			
		FileCategory (FILECAT)			
		Finite (FINITE)			
		FileNameCategory (FNCAT)			
		GradedModule (GRMOD)			
		LeftOreRing (LORER)			
		Homogeneous Aggregate (HOAGG)			
		IndexedDirectProductCategory (IDPC)			
		LiouvillianFunctionCategory (LFCAT)			
	4.0.76	Monad (MONAD)	 	 ٠	303
		NumericalIntegrationCategory (NUMINT)			
		Numerical Optimization Category (OPTCAT)			
		OrdinaryDifferentialEquationsSolverCategory (ODECAT)			
		OrderedSet (ORDSET)			
		PartialDifferentialEquationsSolverCategory (PDECAT) .			
	4.0.82	PatternMatchable (PATMAB)	 		337

	4.0.83	RealRootCharacterizationCategory (RRCC)
	4.0.84	SegmentExpansionCategory (SEGXCAT)
	4.0.85	SemiGroup (SGROUP)
	4.0.86	SetCategoryWithDegree (SETCATD)
	4.0.87	SExpressionCategory (SEXCAT)
	4.0.88	StepThrough (STEP)
	4.0.89	ThreeSpaceCategory (SPACEC)
5	Category I	Layer 4 383
	5.0.90	AbelianMonoid (ABELMON)
	5.0.91	$\label{eq:affineSpaceCategory} AffineSpaceCategory \; (AFSPCAT) \dots \dots \dots \dots 388$
	5.0.92	BagAggregate (BGAGG)
		CachableSet (CACHSET)
	5.0.94	Collection (CLAGG)
	5.0.95	eq:def:def:def:def:def:def:def:def:def:def
	5.0.96	$ExpressionSpace \ (ES) \dots \dots \dots \dots \dots \dots \dots \dots \dots $
	5.0.97	$\label{eq:GradedAlgebra} GradedAlgebra \ (GRALG) \ \dots \ $
	5.0.98	$Indexed Aggregate \ (IXAGG) \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $
		$MonadWithUnit\ (MONADWU) \dots \dots \dots \dots 449$
	5.0.100	Monoid (MONOID)
		$\label{eq:orderedFinite} OrderedFinite\ (ORDFIN)\ \dots\ \dots\ \dots\ \dots\ \dots\ 461$
	5.0.102	PlacesCategory (PLACESC)
		ProjectiveSpaceCategory (PRSPCAT)
		RecursiveAggregate (RCAGG)
	5.0.105	TwoDimensionalArrayCategory (ARR2CAT) 481
6	Category I	Layer 5 497
	6.0.106	BinaryRecursiveAggregate (BRAGG)
	6.0.107	CancellationAbelianMonoid (CABMON)
		DictionaryOperations (DIOPS)
	6.0.109	DoublyLinkedAggregate (DLAGG)
	6.0.110	Group (GROUP)
	6.0.111	$\label{linearAggregate} LinearAggregate \; (LNAGG) \;\; \dots \;$
	6.0.112	MatrixCategory (MATCAT) 540
	6.0.113	OrderedAbelianSemiGroup (OASGP)
	6.0.114	OrderedMonoid (ORDMON)
	6.0.115	PolynomialSetCategory (PSETCAT)
		PriorityQueueAggregate (PRQAGG) 617
	6.0.117	QueueAggregate (QUAGG)
	6.0.118	SetAggregate (SETAGG)
	6.0.119	StackAggregate (SKAGG)
		UnaryRecursiveAggregate (URAGG) 642

7	Category Layer 6	673
	7.0.121 AbelianGroup (ABELGRP)	. 673
	7.0.122 Binary Tree Category (BTCAT)	. 680
	7.0.123 Dictionary (DIAGG)	. 687
	$7.0.124 Dequeue Aggregate (DQAGG) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots $. 694
	7.0.125 ExtensibleLinearAggregate (ELAGG)	. 700
	7.0.126 FiniteLinearAggregate (FLAGG)	. 709
	7.0.127 Free Abelian Monoid Category (FAMONC)	. 719
	7.0.128 MultiDictionary (MDAGG)	
	7.0.129 Ordered Abelian Monoid (OAMON)	. 730
	7.0.130 PermutationCategory (PERMCAT)	. 734
	7.0.131 StreamAggregate (STAGG)	. 739
	7.0.132 TriangularSetCategory (TSETCAT)	. 750
8	Category Layer 7	775
	8.0.133 FiniteDivisorCategory (FDIVCAT)	. 776
	8.0.134 FiniteSetAggregate (FSAGG)	. 781
	8.0.135 KeyedDictionary (KDAGG)	. 792
	8.0.136 Lazy Stream Aggregate (LZSTAGG) 799
	$8.0.137 Left Module \; (LMODULE) \;\; . \;\; . \;\; . \;\; . \;\; . \;\; . \;\; . \;\;$. 823
	$8.0.138 List Aggregate (LSAGG) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots $. 827
	$8.0.139\mathrm{MultisetAggregate}(\mathrm{MSETAGG})\ldots\ldots\ldots\ldots\ldots$. 843
	8.0.140 NonAssociativeRng (NARNG)	. 849
	8.0.141 OneDimensionalArrayAggregate (A1AGG)	. 854
	$8.0.142 {\rm Ordered Cancellation Abelian Monoid}({\rm OCAMON})\ldots\ldots.$. 870
	8.0.143 Regular Triangular Set Category (RSETCAT)	
	$8.0.144 {\rm RightModule} \left({\rm RMODULE} \right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots $. 892
	8.0.145 Rng (RNG)	. 896
9	Category Layer 8	901
	9.0.146 BiModule (BMODULE)	
	9.0.147 BitAggregate (BTAGG)	
	9.0.148 NonAssociativeRing (NASRING)	
	9.0.149 Normalized Triangular Set Category (NTSCAT)	
	$9.0.150\mathrm{OrderedAbelianGroup}$ (OAGROUP)	. 932
	9.0.151 Ordered Abelian Monoid Sup (OAMONS)	
	$9.0.152\mathrm{OrderedMultisetAggregate}(\mathrm{OMSAGG})\ldots\qquad\ldots\qquad\ldots$. 939
	9.0.153 Ring (RING)	
	$9.0.154\mathrm{SquareFreeRegularTriangularSetCategory}$ (SFRTCAT)	. 952
	$9.0.155\mathrm{StringAggregate}$ (SRAGG)	
	9.0.156 Table Aggregate (TBAGG) \dots	. 972
	9.0.157 VectorCategory (VECTCAT)	. 985

997
. 997
. 1010
. 1015
. 1019
. 1024
. 1029
. 1034
. 1040
. 1045
. 1050
. 1055
. 1061
. 1068
. 1075
. 1085
. 1093
. 1101
. 1116
1121
. 1121
. 1127
. 1134
. 1140
. 1145
. 1154
. 1160
. 1164
1173
. 1173
. 1185
. 1191
. 1219
. 1225
. 1232
. 1238
. 1252
. 1266
. 1279

13 Category Layer 12	1287
13.0.194AbelianMonoidRing (AMR)	. 1287
13.0.19 Fortran Machine Type Category (FMTC)	. 1295
13.0.19 Framed Non Associative Algebra (FRNAALG)	
13.0.19 GcdDomain (GCDDOM)	
13.0.19@rderedIntegralDomain (OINTDOM)	
14 Category Layer 13	1331
14.0.19 Finite Abelian Monoid Ring (FAMR)	
14.0.20 IntervalCategory (INTCAT)	
14.0.20 Power Series Category (PSCAT)	
14.0.20 P rincipalIdealDomain (PID)	
14.0.203UniqueFactorizationDomain (UFD)	. 1362
15 Category Layer 14	1369
15.0.20 Divisor Category (DIVCAT)	
15.0.20 Euclidean Domain (EUCDOM)	
15.0.20 Multivariate Taylor Series Category (MTSCAT)	
15.0.20 Polynomial Factorization Explicit (PFECAT)	
15.0.20 Univariate Power Series Category (UPSCAT)	
13.0.20@ invariater owerseries category (OT SCAT)	. 1401
16 Category Layer 15	1413
16.0.20 F ield (FIELD)	. 1413
16.0.21 Integer Number System (INS) $\dots \dots \dots \dots \dots \dots \dots$. 1420
16.0.21LocalPowerSeriesCategory (LOCPOWC)	. 1434
16.0.21 P AdicIntegerCategory (PADICCT)	. 1443
16.0.21 Polynomial Category (POLYCAT)	. 1449
16.0.214JnivariateTaylorSeriesCategory (UTSCAT)	
17 Category Layer 16	1497
17.0.215AlgebraicallyClosedField (ACF)	
17.0.21 Differential Polynomial Category (DPOLCAT)	
$17.0.21 \textbf{F} ield Of Prime Characteristic \ (FPC) \ \dots \ \dots \ \dots \ \dots \ \dots \ \dots$	
17.0.21FiniteRankAlgebra (FINRALG)	
17.0.21FunctionSpace (FS)	
$17.0.22 \textbf{0} \text{nfinitly Close Point Category (INFCLCT)} \dots \dots \dots \dots \dots \dots$	
$17.0.22 \\ Pseudo \\ Algebraic \\ Closure \\ Of Perfect \\ Field \\ Category \ (PACPERC) \ . \ . \ . \ .$. 1588
17.0.222QuotientFieldCategory (QFCAT)	. 1595
17.0.22RealClosedField (RCFIELD)	. 1611
17.0.22RealNumberSystem (RNS)	
17.0.22 Recursive Polynomial Category (RPOLCAT)	
17.0.22@inivariateLaurentSeriesCategory (ULSCAT)	
17.0.22 Univariate Puiseux Series Category (UPXSCAT)	
17.0.22& Drivariate Polynomial Category (UPOLYC)	

18 Category Layer 17	1739
18.0.229AlgebraicallyClosedFunctionSpace (ACFS)	. 1739
18.0.23ŒxtensionField (XF)	. 1754
18.0.23 FiniteFieldCategory (FFIELDC)	. 1762
18.0.23 Floating Point System (FPS)	
18.0.23\(\mathbf{F}\)ramedAlgebra (FRAMALG)	
18.0.234 seudo Algebraic Closure Of Finite Field Category (PACFFC)	
18.0.235UnivariateLaurentSeriesConstructorCategory (ULSCCAT)	
18.0.236 Univariate Puiseux Series Constructor Category (UPXSCCA)	
10.0.25@ hivariater discussories constructor category (or Abcort)	. 1017
19 Category Layer 18	1829
19.0.23 Finite Algebraic Extension Field (FAXF)	
19.0.23&MonogenicAlgebra (MONOGEN)	
19.0.23\PseudoAlgebraicClosureOfRationalNumberCategory (PACRATC) .	
13.0.254 Scudoffigebraic closure officational vulnor category (1110101110)	. 1000
20 Category Layer 19	1869
20.0.24@complexCategory (COMPCAT)	
20.0.24 Function Field Category (FFCAT)	
20.0.24PseudoAlgebraicClosureOfAlgExtOfRationalNumberCategory (PACI	
	,
21 The bootstrap code	1937
21.1 ABELGRP.lsp BOOTSTRAP	. 1937
21.2 ABELGRPlsp BOOTSTRAP	. 1938
21.3 ABELMON.lsp BOOTSTRAP	. 1939
21.4 ABELMONlsp BOOTSTRAP	. 1940
21.5 ABELSG.lsp BOOTSTRAP	. 1942
21.6 ABELSGlsp BOOTSTRAP	
21.7 ALAGG.lsp BOOTSTRAP	. 1944
21.8 CABMON.lsp BOOTSTRAP	
21.9 CLAGG.lsp BOOTSTRAP	
21.10CLAGGlsp BOOTSTRAP	
21.11COMRING.lsp BOOTSTRAP	
21.12DIFRING.lsp BOOTSTRAP	
21.13DIFRINGlsp BOOTSTRAP	
21.14DIVRING.lsp BOOTSTRAP	
21.15DIVRINGlsp BOOTSTRAP	
21.16ES.lsp BOOTSTRAP	
21.17ESlsp BOOTSTRAP	. 1900
1	
21.18.1 The Lisp Implementation	
21.19EUCDOMlsp BOOTSTRAP	
21.19.1 The Lisp Implementation	
21.20ENTIRER.lsp BOOTSTRAP	
21.21FFIELDC.lsp BOOTSTRAP	
21.22FFIELDClsp BOOTSTRAP	
21 23FPS lsp BOOTSTRAP	2001

21.24FPSlsp BOOTSTRAP				 	 		 		. 2	2002
21.25GCDDOM.lsp BOOTSTRAP .										
21.26GCDDOMlsp BOOTSTRAP				 	 				. 2	2005
21.27HOAGG.lsp BOOTSTRAP				 	 				. 2	2009
21.28HOAGGlsp BOOTSTRAP				 	 				. 2	2011
21.29INS.lsp BOOTSTRAP				 	 				. 2	2016
21.30INSlsp BOOTSTRAP				 	 				. 2	2018
21.31INTDOM.lsp BOOTSTRAP .				 	 				. 2	2025
21.32INTDOMlsp BOOTSTRAP .				 	 				. 2	2026
21.33LNAGG.lsp BOOTSTRAP										
21.34LNAGGlsp BOOTSTRAP										
21.35LSAGG.lsp BOOTSTRAP				 	 				. 2	2032
21.36LSAGGlsp BOOTSTRAP				 	 				. 2	2033
21.37MONOID.lsp BOOTSTRAP .				 	 				. 2	2049
21.38MONOIDlsp BOOTSTRAP .				 	 				. 2	2050
										2051
21.40OINTDOM.lsp BOOTSTRAP				 	 				. 2	2053
21.41ORDRING.lsp BOOTSTRAP .										
21.42ORDRINGlsp BOOTSTRAP										
21.43POLYCAT.lsp BOOTSTRAP .										
21.44POLYCATlsp BOOTSTRAP										
21.45PSETCAT.lsp BOOTSTRAP .										
21.46PSETCATlsp BOOTSTRAP										2089
21.47QFCAT.lsp BOOTSTRAP				 	 				. 2	2105
21.48QFCATlsp BOOTSTRAP				 	 				. 2	2107
21.49RCAGG.lsp BOOTSTRAP										
21.50RCAGGlsp BOOTSTRAP										
21.51RING.lsp BOOTSTRAP										
21.52RINGlsp BOOTSTRAP										
21.53RNG.lsp BOOTSTRAP										
21.54RNS.lsp BOOTSTRAP										
21.55RNSlsp BOOTSTRAP				 	 				. 2	2121
21.56SETAGG.lsp BOOTSTRAP										
21.57SETAGGlsp BOOTSTRAP .										
21.58SETCAT.lsp BOOTSTRAP										
-										2128
				 	 				. 2	2130
21.61STAGGlsp BOOTSTRAP									_	2131
21.62TSETCAT.lsp BOOTSTRAP .				 	 				. 2	2137
21.63TSETCATlsp BOOTSTRAP										
21.64UFD.lsp BOOTSTRAP										
21.65UFDlsp BOOTSTRAP										
21.66ULSCAT.lsp BOOTSTRAP										
21.67UPOLYC.lsp BOOTSTRAP										
21.68UPOLYClsp BOOTSTRAP .										
21.69URAGG.lsp BOOTSTRAP										

186	CONTENTS

	21.70URAGGlsp BOOTSTRAP	. 2188
22	The Proofs	2201
23	Chunk collections	2205
Bi	bliography	2221
Inc	dex	2233

Volume 10.3: Axiom Algebra: Domains

1	Chapter Overview	1
2	Chapter A	3
	domain AFFPL AffinePlane	3
	AffinePlane (AFFPL)	4
	${\it domain AFFPLPS Affine Plane Over Pseudo Algebraic Closure Of Finite Field} $	5
	$Affine Plane Over Pseudo Algebraic Closure Of Finite Field \ (AFFPLPS) \ . \ . \ . \ . \ .$	6
	domain AFFSP AffineSpace	7
	AffineSpace (AFFSP)	9
	domain ALGSC AlgebraGivenByStructuralConstants	13
	Some examples of algebras in genetics	14
	Commutative, non-associative algebras	14
	$\label{eq:AlgebraGivenByStructuralConstants} \ (ALGSC) \ \ \dots \ \dots \ \dots \ \dots \ \dots$	47
	domain ALGFF AlgebraicFunctionField	63
	AlgebraicFunctionField (ALGFF)	68
	domain AN AlgebraicNumber	76
	AlgebraicNumber (AN)	87
	domain ANON AnonymousFunction	89
	AnonymousFunction (ANON)	90
	domain ANTISYM AntiSymm	91
	AntiSymm (ANTISYM)	
	domain ANY Any	
	Any (ANY)	
	domain ASTACK ArrayStack	
	ArrayStack (ASTACK)	
	domain ASP1 Asp1	
	Asp1 (ASP1)	
	domain ASP10 Asp10	
	Asp10 (ASP10)	153
	domain ASP12 Asp12	
	Asp12 (ASP12)	
	domain ASP19 Asp19	
	Asp19 (ASP19)	
	domain ASP20 Asp20	
	Asp20 (ASP20)	
	domain ASP24 Asp24	
	Asp24 (ASP24)	
	domain ASP27 Asp27	
	Asp27 (ASP27)	
	domain ASP28 Asp28	
	Asp28 (ASP28)	
	domain ASP29 Asp29	
	Asp29 (ASP29)	204

domain ASP30 Asp30	
Asp30 (ASP30)	
domain ASP31 Asp31	
Asp31 (ASP31)	5
domain ASP33 Asp33	L
Asp33 (ASP33)	2
domain ASP34 Asp34	1
Asp34 (ASP34)	3
domain ASP35 Asp35	
Asp35 (ASP35)	
domain ASP4 Asp4	
Asp4 (ASP4)	
domain ASP41 Asp41	
Asp41 (ASP41)	
domain ASP42 Asp42	
Asp42 (ASP42)	
domain ASP49 Asp49	
Asp49 (ASP49)	
domain ASP50 Asp50	
Asp50 (ASP50)	
domain ASP55 Asp55	
Asp55 (ASP55)	
domain ASP6 Asp6	
Asp6 (ASP6)	
domain ASP7 Asp7	
Asp7 (ASP7)	
domain ASP73 Asp73	
Asp73 (ASP73)	
domain ASP74 Asp74	
Asp74 (ASP74)	
domain ASP77 Asp77	
Asp77 (ASP77)	
domain ASP78 Asp78	
Asp78 (ASP78)	
domain ASP8 Asp8	
Asp8 (ASP8)	
domain ASP80 Asp80	
Asp80 (ASP80)	
domain ASP9 Asp9	
Asp9 (ASP9)	3
domain JORDAN AssociatedJordanAlgebra	3
AssociatedJordanAlgebra (JORDAN)	3
domain LIE AssociatedLieAlgebra)
AssociatedLieAlgebra (LIE)	2
domain ALIST AssociationList	5
AssociationList (ALIST)	}

	domain ATTRBUT Attribute Buttons $\ \ldots \ \ldots \ \ldots \ \ldots \ \ldots \ \ldots$	
	AttributeButtons (ATTRBUT)	
	domain AUTOMOR Automorphism	
	Automorphism (AUTOMOR)	387
3	Chapter B	391
	domain BBTREE BalancedBinaryTree	391
	BalancedBinaryTree (BBTREE)	
	domain BPADIC BalancedPAdicInteger	
	BalancedPAdicInteger (BPADIC)	
	domain BPADICRT BalancedPAdicRational	
	BalancedPAdicRational (BPADICRT)	
	domain BFUNCT BasicFunctions	
	BasicFunctions (BFUNCT)	
	domain BOP BasicOperator	
	BasicOperator (BOP)	
	domain BSD BasicStochasticDifferential	
	BasicStochasticDifferential (BSD)	
	domain BINARY BinaryExpansion	
	BinaryExpansion (BINARY)	
	domain BINFILE BinaryFile	
	BinaryFile (BINFILE)	
	domain BSTREE BinarySearchTree	
	BinarySearchTree (BSTREE)	
	domain BTOURN BinaryTournament	
	BinaryTournament (BTOURN)	
	domain BTREE BinaryTree	
	BinaryTree (BTREE)	
	domain BITS Bits	
	Bits (BITS)	
	domain BLHN BlowUpWithHamburgerNoether	
	BlowUpWithHamburgerNoether (BLHN)	
	domain BLQT BlowUpWithQuadTrans	
	BlowUpWithQuadTrans (BLQT)	
	domain BOOLEAN Boolean	
	Boolean (BOOLEAN)	478
Ļ	Chapter C	483
	domain CARD CardinalNumber	
	CardinalNumber (CARD)	
	domain CARTEN Cartesian Tensor	
	Cartesian Tensor (CARTEN)	
	domain CELL Cell	
	Cell (CELL)	
	domain CHAR Character	
	Character (CHAR)	
	Onaractic (Onart)	949

	domain CCLASS CharacterClass
	CharacterClass (CCLASS)
	domain CLIF CliffordAlgebra
	Vector (linear) spaces
	Quadratic Forms
	Quadratic spaces, Clifford Maps
	Universal Clifford algebras
	Real Clifford algebras $\mathbb{R}_{p,q}$
	Notation for integer sets
	Frames for Clifford algebras
	Real frame groups
	ÿ 1
	Canonical products
	Clifford algebra of frame group
	Neutral matrix representations
	Why So Many Product Types?
	instantiate an instance of CliffordAlgebra
	CliffordAlgebra (CLIF)
	domain COLOR Color
	Color (COLOR)
	domain COMM Commutator
	Commutator (COMM)
	domain COMPLEX Complex
	Complex (COMPLEX)
	domain CDFMAT ComplexDoubleFloatMatrix
	ComplexDoubleFloatMatrix (CDFMAT) 611
	domain CDFVEC ComplexDoubleFloatVector
	ComplexDoubleFloatVector (CDFVEC)
	domain CONTFRAC ContinuedFraction
	ContinuedFraction (CONTFRAC)
5	Chapter D 647
	domain DBASE Database
	Database (DBASE)
	domain DLIST DataList
	DataList (DLIST)
	domain DECIMAL DecimalExpansion
	DecimalExpansion (DECIMAL)
	domain DHMATRIX DenavitHartenbergMatrix
	Homogeneous Transformations
	Notation
	Vectors
	Planes
	Transformations
	Transformation
	Rotation Transformations
	Coordinate Frames
	Coordinate Frames

Relative Transformations	. 673
Objects	. 674
Inverse Transformations	. 675
General Rotation Transformation	. 676
Equivalent Angle and Axis of Rotation	
Example 1.1	. 681
Stretching and Scaling	
Perspective Transformations	. 683
Transform Equations	. 685
Summary	. 685
DenavitHartenbergMatrix (DHMATRIX)	. 701
domain DEQUEUE Dequeue	
Dequeue (DEQUEUE)	
domain DERHAM DeRhamComplex	. 729
DeRhamComplex (DERHAM)	
domain DSTREE DesingTree	
DesingTree (DSTREE)	
domain DSMP DifferentialSparseMultivariatePolynomial	
DifferentialSparseMultivariatePolynomial (DSMP)	
domain DIRPROD DirectProduct	
DirectProduct (DIRPROD)	
domain DPMM DirectProductMatrixModule	
DirectProductMatrixModule (DPMM)	
domain DPMO DirectProductModule	
DirectProductModule (DPMO)	
domain DIRRING DirichletRing	
DirichletRing (DIRRING)	
domain DMP DistributedMultivariatePolynomial	
DistributedMultivariatePolynomial (DMP)	
domain DIV Divisor	
Divisor (DIV)	
domain DFLOAT DoubleFloat	
DoubleFloat (DFLOAT)	
domain DFMAT DoubleFloatMatrix	
DoubleFloatMatrix (DFMAT)	
domain DFVEC DoubleFloatVector	
DoubleFloatVector (DFVEC)	
domain DROPT DrawOption	
DrawOption (DROPT)	
domain D01AJFA d01ajfAnnaType	
d01ajfAnnaType (D01AJFA)	
domain D01AKFA d01akfAnnaType	
d01akfAnnaType (D01AKFA)	
domain D01ALFA d01alfAnnaType	
d01alfAnnaType (D01ALFA)	
domain D01AMFA d01amfAnnaType	

	$d01amfAnnaType (D01AMFA) \dots \dots$	14
	domain D01ANFA d01anfAnnaType	17
	d01anfAnnaType (D01ANFA)	
	domain D01APFA d01apfAnnaType	
	$d01apfAnnaType (D01APFA) \dots \dots$	
	domain D01AQFA d01aqfAnnaType	
	d01aqfAnnaType (D01AQFA)	
	domain D01ASFA d01asfAnnaType	
	d01asfAnnaType (D01ASFA)	
	domain D01FCFA d01fcfAnnaType	
	d01fcfAnnaType (D01FCFA)	
	domain D01GBFA d01gbfAnnaType	
	d01gbfAnnaType (D01GBFA)	
	domain D01TRNS d01TransformFunctionType	
	d01TransformFunctionType (D01TRNS)	
	domain D02BBFA d02bbfAnnaType	
	d02bbfAnnaType (D02BBFA)	
	domain D02BHFA d02bhfAnnaType	
	d02bhfAnnaType (D02BHFA)	
	domain D02CJFA d02cjfAnnaType	
	d02cjfAnnaType (D02CJFA)	
	domain D02EJFA d02ejfAnnaType	
	d02ejfAnnaType (D02EJFA)	
	domain D03EEFA d03eefAnnaType	
	d03eefAnnaType (D03EEFA)	
	domain D03FAFA d03fafAnnaType	
	$d03fafAnnaType (D03FAFA) \dots 97$	78
c		11
6	Chapter E 98	
	domain EFULS ElementaryFunctionsUnivariateLaurentSeries	
	ElementaryFunctionsUnivariateLaurentSeries (EFULS)	
	domain EFUPXS ElementaryFunctionsUnivariatePuiseuxSeries	
	ElementaryFunctionsUnivariatePuiseuxSeries (EFUPXS)	
	domain EQ Equation	
	Equation (EQ)	
	domain EQTBL EqTable	
	EqTable (EQTBL)	
	domain EMR EuclideanModularRing	
	EuclideanModularRing (EMR)	
	domain EXIT Exit	
	Exit (EXIT)	
	domain EXPEXPAN ExponentialExpansion	
	ExponentialExpansion (EXPEXPAN)	
	domain EXPR Expression	
	Expression (EXPR)	
	domain EXPUPXS ExponentialOfUnivariatePuiseuxSeries 10	189

	ExponentialOfUnivariatePuiseuxSeries (EXPUPXS)	. 1093
	domain EAB ExtAlgBasis	. 1096
	ExtAlgBasis (EAB)	. 1097
	domain E04DGFA e04dgfAnnaType	. 1100
	e04dgfAnnaType (E04DGFA)	. 1101
	domain E04FDFA e04fdfAnnaType	. 1104
	e04fdfAnnaType (E04FDFA)	. 1105
	domain E04GCFA e04gcfAnnaType	. 1110
	e04gcfAnnaType (E04GCFA)	. 1111
	domain E04JAFA e04jafAnnaType	. 1116
	e04jafAnnaType (E04JAFA)	. 1117
	domain E04MBFA e04mbfAnnaType	. 1121
	e04mbfAnnaType (E04MBFA)	. 1122
	domain E04NAFA e04nafAnnaType	. 1126
	e04nafAnnaType (E04NAFA)	
	domain E04UCFA e04ucfAnnaType	
	e04ucfAnnaType (E04UCFA)	
	,	
7	Chapter F	1137
	domain FR Factored	
	Factored (FR)	
	domain FILE File	
	File (FILE)	
	domain FNAME FileName	
	FileName (FNAME)	
	domain FDIV FiniteDivisor	
	FiniteDivisor (FDIV)	
	domain FF FiniteField	. 1192
	FiniteField (FF)	. 1195
	domain FFCG FiniteFieldCyclicGroup	
	FiniteFieldCyclicGroup (FFCG)	. 1200
	domain FFCGX FiniteFieldCyclicGroupExtension	. 1202
	$\label{prop:equation:first} Finite Field Cyclic Group Extension \ (FFCGX) \ \dots \ \dots \ \dots \ \dots \ \dots \ \dots$. 1205
	domain FFCGP FiniteFieldCyclicGroupExtensionByPolynomial	. 1207
	FiniteFieldCyclicGroupExtensionByPolynomial (FFCGP)	. 1210
	domain FFX FiniteFieldExtension	. 1222
	FiniteFieldExtension (FFX)	. 1225
	domain FFP FiniteFieldExtensionByPolynomial	. 1227
	FiniteFieldExtensionByPolynomial (FFP)	
	domain FFNB FiniteFieldNormalBasis	. 1240
	FiniteFieldNormalBasis (FFNB)	
	domain FFNBX FiniteFieldNormalBasisExtension	
	FiniteFieldNormalBasisExtension (FFNBX)	
	domain FFNBP FiniteFieldNormalBasisExtensionByPolynomial	
	FiniteFieldNormalBasisExtensionByPolynomial (FFNBP)	
	domain FARRAY FlexibleArray	

FlexibleArray (FARRAY)
domain FLOAT Float
Float (FLOAT)
domain FC FortranCode
FortranCode (FC)
domain FEXPR FortranExpression
FortranExpression (FEXPR)
domain FORTRAN FortranProgram
FortranProgram (FORTRAN)
domain FST FortranScalarType
FortranScalarType (FST)
domain FTEM FortranTemplate
FortranTemplate (FTEM)
domain FT FortranType
FortranType (FT)
domain FCOMP FourierComponent
FourierComponent (FCOMP)
domain FSERIES FourierSeries
FourierSeries (FSERIES)
domain FRAC Fraction
Fraction (FRAC)
domain FRIDEAL FractionalIdeal
FractionalIdeal (FRIDEAL)
domain FRMOD FramedModule
FramedModule (FRMOD)
domain FAGROUP FreeAbelianGroup
FreeAbelianGroup (FAGROUP)
domain FAMONOID FreeAbelianMonoid
FreeAbelianMonoid (FAMONOID)
domain FGROUP FreeGroup
FreeGroup (FGROUP)
domain FM FreeModule
FreeModule (FM)
domain FM1 FreeModule1
FreeModule1 (FM1)
domain FMONOID FreeMonoid
FreeMonoid (FMONOID)
domain FNLA FreeNilpotentLie
FreeNilpotentLie (FNLA)
domain FPARFRAC FullPartialFractionExpansion
FullPartialFractionExpansion (FPARFRAC)
domain FUNCTION FunctionCalled
Function Called (FUNCTION) 1501

8	Chapter G	1	503
	domain GDMP GeneralDistributedMultivariatePolynomial		1503
	GeneralDistributedMultivariatePolynomial (GDMP)		1513
	domain GMODPOL GeneralModulePolynomial		1523
	GeneralModulePolynomial (GMODPOL)		1524
	domain GCNAALG GenericNonAssociativeAlgebra		1527
	GenericNonAssociativeAlgebra (GCNAALG)		1530
	domain GPOLSET GeneralPolynomialSet		1540
	GeneralPolynomialSet (GPOLSET)		1542
	domain GSTBL GeneralSparseTable		
	GeneralSparseTable (GSTBL)		
	domain GTSET GeneralTriangularSet		
	GeneralTriangularSet (GTSET)		1554
	domain GSERIES GeneralUnivariatePowerSeries		
	GeneralUnivariatePowerSeries (GSERIES)		1563
	domain GRIMAGE GraphImage		1568
	GraphImage (GRIMAGE)		1569
	domain GOPT GuessOption		1583
	GuessOption (GOPT)		
	domain GOPT0 GuessOptionFunctions0		
	GuessOptionFunctions0 (GOPT0)		1592
9	Chapter H		603
	domain HASHTBL HashTable		
	HashTable (HASHTBL)		
	domain HEAP Heap		
	Heap (HEAP)		
	domain HEXADEC HexadecimalExpansion		
	HexadecimalExpansion (HEXADEC)		
	package HTMLFORM HTMLFormat		
	Overview		
	Why output to HTML?		
	Using the formatter		
	Form of the output		1636
	Matrix Formatting		1636
	Programmers Guide		1637
	Future Developments		1637
	HTMLFormat (HTMLFORM)		1641
	domain HDP HomogeneousDirectProduct		1673
	HomogeneousDirectProduct (HDP)		1676
	domain HDMP HomogeneousDistributedMultivariatePolynomial		1678
	HomogeneousDistributedMultivariatePolynomial (HDMP)		
	domain HELLFDIV HyperellipticFiniteDivisor		1686
	HyperellipticFiniteDivisor (HELLFDIV)		1000

10 Chapter I	1695
domain ICP InfClsPt	1695
InfClsPt (ICP)	1696
domain ICARD IndexCard	
IndexCard (ICARD)	1699
domain IBITS IndexedBits	
IndexedBits (IBITS)	1707
domain IDPAG IndexedDirectProductAbelianGroup	1710
IndexedDirectProductAbelianGroup (IDPAG)	1712
domain IDPAM IndexedDirectProductAbelianMonoid	1715
IndexedDirectProductAbelianMonoid (IDPAM)	1716
domain IDPO IndexedDirectProductObject	1720
IndexedDirectProductObject (IDPO)	
domain IDPOAM IndexedDirectProductOrderedAbelianMonoid	1723
IndexedDirectProductOrderedAbelianMonoid (IDPOAM)	1725
domain IDPOAMS IndexedDirectProductOrderedAbelianMonoidSup	
IndexedDirectProductOrderedAbelianMonoidSup (IDPOAMS)	
domain INDE IndexedExponents	
IndexedExponents (INDE)	
domain IFARRAY IndexedFlexibleArray	
IndexedFlexibleArray (IFARRAY)	
domain ILIST IndexedList	
IndexedList (ILIST)	1748
domain IMATRIX IndexedMatrix	
IndexedMatrix (IMATRIX)	
domain IARRAY1 IndexedOneDimensionalArray	
IndexedOneDimensionalArray (IARRAY1)	
domain ISTRING IndexedString	
IndexedString (ISTRING)	
domain IARRAY2 IndexedTwoDimensionalArray	
IndexedTwoDimensionalArray (IARRAY2)	
domain IVECTOR IndexedVector	
IndexedVector (IVECTOR)	
domain ITUPLE InfiniteTuple	
InfiniteTuple (ITUPLE)	
domain INFCLSPT InfinitlyClosePoint	
InfinitlyClosePoint (INFCLSPT)	
domain INFCLSPS InfinitlyClosePointOverPseudoAlgebraicClosureOfFiniteField	
InfinitlyClosePointOverPseudoAlgebraicClosureOfFiniteField (INFCLSPS)	
domain IAN InnerAlgebraicNumber	
InnerAlgebraicNumber (IAN)	
domain IFF InnerFiniteField	
InnerFiniteField (IFF)	
domain IFAMON InnerFreeAbelianMonoid	
InnerFreeAbelianMonoid (IFAMON)	
domain IIARRAY2 InnerIndexedTwoDimensionalArray	

CONTENTS	197
----------	-----

InnerIndexedTwoDimensionalArray (IIARRAY2)	182
domain IPADIC InnerPAdicInteger	
InnerPAdicInteger (IPADIC)	
domain IPF InnerPrimeField	
InnerPrimeField (IPF)	
domain ISUPS InnerSparseUnivariatePowerSeries	
InnerSparseUnivariatePowerSeries (ISUPS)	
domain INTABL InnerTable	
InnerTable (INTABL)	
domain ITAYLOR InnerTaylorSeries	
InnerTaylorSeries (ITAYLOR)	
domain INFORM InputForm	
InputForm (INFORM)	
domain INT Integer	
Integer (INT)	
domain ZMOD IntegerMod	
IntegerMod (ZMOD)	
domain INTFTBL IntegrationFunctionsTable	
IntegrationFunctionsTable (INTFTBL)	
domain IR IntegrationResult	
IntegrationResult (IR)	
domain INTRVL Interval	
Interval (INTRVL)	196
Interval (INTRVL)	196
11 Chapter J	196 1979
11 Chapter J	1979
11 Chapter J 12 Chapter K	1979 1981
11 Chapter J 12 Chapter K domain KERNEL Kernel	1979 1981 198
11 Chapter J 12 Chapter K domain KERNEL Kernel	1979 1981 198 198
11 Chapter J 12 Chapter K domain KERNEL Kernel	1979 1981 198 198 199
11 Chapter J 12 Chapter K domain KERNEL Kernel	1979 1981 198 198 199
11 Chapter J 12 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE)	1979 1981 198 198 199 200
11 Chapter J 12 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L	1979 1981 198 198 199 200
11 Chapter J 12 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial	1979 1981 198 198 199 200 2007 200
11 Chapter J 12 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL)	1979 1981 198 198 199 200 2007 200 200
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library	1979 1981 198 198 199 200 2007 200 200 201
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB)	1979 1981 198 198 199 200 2007 200 201 202
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials	1979 1981 198 198 199 200 2007 200 200 201 202 202
11 Chapter J 12 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials LieExponentials (LEXP)	1979 1981 . 198 . 198 . 199 . 200 2007 . 200 . 200 . 201 . 202 . 202 . 202
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials LieExponentials (LEXP) domain LPOLY LiePolynomial	1979 1981 . 198 . 198 . 199 . 200 2007 . 200 . 200 . 201 . 202 . 202 . 202 . 203
11 Chapter J 12 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials LieExponentials (LEXP) domain LPOLY LiePolynomial LiePolynomial (LPOLY)	1979 1981 198 198 199 200 2007 200 201 202 202 203 204
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials LieExponentials (LEXP) domain LPOLY LiePolynomial LiePolynomial (LPOLY) domain LSQM LieSquareMatrix	1979 1981 198 198 199 200 2007 200 201 202 202 203 204 204
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials LieExponentials (LEXP) domain LPOLY LiePolynomial LiePolynomial (LPOLY) domain LSQM LieSquareMatrix LieSquareMatrix (LSQM)	1979 1981 198 198 199 200 2007 200 201 202 202 203 204 205
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials LieExponentials (LEXP) domain LPOLY LiePolynomial LiePolynomial (LPOLY) domain LSQM LieSquareMatrix LieSquareMatrix (LSQM) domain LODO LinearOrdinaryDifferentialOperator	1979 1981 198 198 199 200 2007 200 201 202 202 202 203 204 205 205
11 Chapter K domain KERNEL Kernel Kernel (KERNEL) domain KAFILE KeyedAccessFile KeyedAccessFile (KAFILE) 13 Chapter L domain LAUPOL LaurentPolynomial LaurentPolynomial (LAUPOL) domain LIB Library Library (LIB) domain LEXP LieExponentials LieExponentials (LEXP) domain LPOLY LiePolynomial LiePolynomial (LPOLY) domain LSQM LieSquareMatrix LieSquareMatrix (LSQM)	1979 1981 198 198 199 200 2007 200 201 202 202 202 203 204 205 206

	LinearOrdinaryDifferentialOperator1 (LODO1)	2078
	domain LODO2 LinearOrdinaryDifferentialOperator2	2079
	LinearOrdinaryDifferentialOperator2 (LODO2)	2090
	domain LIST List	2092
	List (LIST)	2105
	domain LMOPS ListMonoidOps	2111
	ListMonoidOps (LMOPS)	
	domain LMDICT ListMultiDictionary	
	ListMultiDictionary (LMDICT)	
	domain LA LocalAlgebra	
	LocalAlgebra (LA)	
	domain LO Localize	
	Localize (LO)	
	domain LWORD LyndonWord	
	LyndonWord (LWORD)	
	Lyndon word (LwORD)	2142
11	Chapter M 21	49
14	domain MCMPLX MachineComplex	
	MachineComplex (MCMPLX)	
	domain MFLOAT MachineFloat	
	MachineFloat (MFLOAT)	
	domain MINT MachineInteger	
	MachineInteger (MINT)	
	domain MAGMA Magma	
	Magma (MAGMA)	
	domain MKCHSET MakeCachableSet	
	MakeCachableSet (MKCHSET)	
	domain MMLFORM MathMLFormat	
	Introduction to Mathematical Markup Language	
	Displaying MathML	
	Test Cases	2192
)set output mathml on	
	File src/interp/setvars.boot.pamphlet	
	File setvart.boot.pamphlet	2194
	File src/algebra/Makefile.pamphlet	2194
	File src/algebra/exposed.lsp.pamphlet	2194
	File src/algebra/Lattice.pamphlet	2194
	File src/doc/axiom.bib.pamphlet	
		2195
		2195
		2197
		2198
		2200
		2201
		2216
	- " "	2220

CONTENTS	199
----------	-----

domain MATRIX Matrix	. 2235
Matrix (MATRIX)	2254
domain MODMON ModMonic	2259
ModMonic (MODMON)	. 2263
domain MODFIELD ModularField	2272
ModularField (MODFIELD)	2273
domain MODRING ModularRing	2275
ModularRing (MODRING)	
domain MODMONOM ModuleMonomial	
ModuleMonomial (MODMONOM)	
domain MODOP ModuleOperator	
ModuleOperator (MODOP)	
domain MOEBIUS MoebiusTransform	
MoebiusTransform (MOEBIUS)	
domain MRING MonoidRing	
MonoidRing (MRING)	
domain MSET Multiset	
Multiset (MSET)	
domain MPOLY MultivariatePolynomial	
MultivariatePolynomial (MPOLY)	
domain MYEXPR MyExpression	
MyExpression (MYEXPR)	
domain MYUP MyUnivariatePolynomial	
MyUnivariatePolynomial (MYUP)	
MyUnivariaterolynomiai (MYUP)	. 2551
15 Chapter N	2355
domain NSDPS NeitherSparseOrDensePowerSeries	2355
NeitherSparseOrDensePowerSeries (NSDPS)	
domain NSMP NewSparseMultivariatePolynomial	
NewSparseMultivariatePolynomial (NSMP)	
domain NSUP NewSparseUnivariatePolynomial	
NewSparseUnivariatePolynomial (NSUP)	
domain NONE None	
None (NONE)	
domain NNI NonNegativeInteger	
NonNegativeInteger (NNI)	
NonNegativeInteger (NNI)	
domain NOTTING NottinghamGroup	
domain NOTTING NottinghamGroup	2417
domain NOTTING NottinghamGroup	2417 2418
domain NOTTING NottinghamGroup	2417 2418 2420
domain NOTTING NottinghamGroup NottinghamGroup (NOTTING) domain NIPROB NumericalIntegrationProblem NumericalIntegrationProblem (NIPROB) domain ODEPROB NumericalODEProblem	2417 2418 2420 2422
domain NOTTING NottinghamGroup NottinghamGroup (NOTTING) domain NIPROB NumericalIntegrationProblem NumericalIntegrationProblem (NIPROB) domain ODEPROB NumericalODEProblem NumericalODEProblem (ODEPROB)	2417 2418 2420 2422 2424
domain NOTTING NottinghamGroup NottinghamGroup (NOTTING) domain NIPROB NumericalIntegrationProblem NumericalIntegrationProblem (NIPROB) domain ODEPROB NumericalODEProblem NumericalODEProblem (ODEPROB) domain OPTPROB NumericalOptimizationProblem	2417 2418 2420 2422 2424
domain NOTTING NottinghamGroup NottinghamGroup (NOTTING) domain NIPROB NumericalIntegrationProblem NumericalIntegrationProblem (NIPROB) domain ODEPROB NumericalODEProblem NumericalODEProblem (ODEPROB) domain OPTPROB NumericalOptimizationProblem NumericalOptimizationProblem (OPTPROB)	2417 2418 2420 2422 2424 2426
domain NOTTING NottinghamGroup NottinghamGroup (NOTTING) domain NIPROB NumericalIntegrationProblem NumericalIntegrationProblem (NIPROB) domain ODEPROB NumericalODEProblem NumericalODEProblem (ODEPROB) domain OPTPROB NumericalOptimizationProblem	2417 2418 2420 2422 2424 2424 2426 2427

16 Chapter O	2435
domain OCT Octonion	. 2435
Octonion (OCT)	
domain ODEIFTBL ODEIntensityFunctionsTable	
ODEIntensityFunctionsTable (ODEIFTBL)	. 2446
domain ARRAY1 OneDimensionalArray	. 2450
OneDimensionalArray (ARRAY1)	. 2454
domain ONECOMP OnePointCompletion	. 2456
$One Point Completion \ (ONE COMP) \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $. 2458
domain OMCONN OpenMathConnection	. 2463
OpenMathConnection (OMCONN)	. 2464
domain OMDEV OpenMathDevice	. 2466
OpenMathDevice (OMDEV)	. 2467
domain OMENC OpenMathEncoding	. 2475
OpenMathEncoding (OMENC)	. 2476
domain OMERR OpenMathError	. 2478
OpenMathError (OMERR)	. 2479
domain OMERRK OpenMathErrorKind	. 2481
OpenMathErrorKind (OMERRK)	. 2483
domain OP Operator	. 2485
Operator (OP)	. 2493
domain OMLO OppositeMonogenicLinearOperator	. 2494
OppositeMonogenicLinearOperator (OMLO)	. 2496
domain ORDCOMP OrderedCompletion	. 2498
OrderedCompletion (ORDCOMP)	. 2499
domain ODP OrderedDirectProduct	. 2505
OrderedDirectProduct (ODP)	. 2511
domain OFMONOID OrderedFreeMonoid	. 2513
OrderedFreeMonoid (OFMONOID)	. 2523
domain OVAR OrderedVariableList	. 2530
OrderedVariableList (OVAR)	. 2533
domain ODPOL OrderlyDifferentialPolynomial	. 2535
OrderlyDifferentialPolynomial (ODPOL)	. 2551
domain ODVAR OrderlyDifferentialVariable	. 2553
OrderlyDifferentialVariable (ODVAR)	
domain ODR OrdinaryDifferentialRing	. 2556
OrdinaryDifferentialRing (ODR)	. 2558
domain OWP OrdinaryWeightedPolynomials	. 2560
OrdinaryWeightedPolynomials (OWP)	. 2561
domain OSI OrdSetInts	. 2563
$OrdSetInts\ (OSI)\ \dots$. 2564
domain OUTFORM OutputForm	. 2566
OutputForm (OUTFORM)	. 2568

17	Chapter P	2589
	domain PADIC PAdicInteger	. 2589
	PAdicInteger (PADIC)	. 2591
	domain PADICRAT PAdicRational	. 2592
	PAdicRational (PADICRAT)	. 2595
	domain PADICRC PAdicRationalConstructor	. 2597
	PAdicRationalConstructor (PADICRC)	. 2600
	domain PALETTE Palette	. 2607
	Palette (PALETTE)	. 2609
	domain PARPCURV ParametricPlaneCurve	. 2611
	ParametricPlaneCurve (PARPCURV)	. 2612
	domain PARSCURV ParametricSpaceCurve	
	ParametricSpaceCurve (PARSCURV)	
	domain PARSURF ParametricSurface	. 2616
	ParametricSurface (PARSURF)	. 2618
	domain PFR PartialFraction	. 2619
	PartialFraction (PFR)	
	domain PRTITION Partition	
	Partition (PRTITION)	
	domain PATTERN Pattern	
	Pattern (PATTERN)	
	domain PATLRES PatternMatchListResult	
	PatternMatchListResult (PATLRES)	
	domain PATRES PatternMatchResult	
	PatternMatchResult (PATRES)	
	domain PENDTREE PendantTree	
	PendantTree (PENDTREE)	
	domain PERM Permutation	
	Permutation (PERM)	
	domain PERMGRP PermutationGroup	
	Introduction by Martin Baker	
	History	
	Scaling Up	
	PermutationGroup Representation	
	How to find Stabilizers	
	Stabilizers as Subgroups	
	Schreier's Lemma	
	Vectors	0-04
	Schreier Vectors (Orbit With SVC)	. 2705
	PermutationGroup Representation	
	Example 1 - Dihedral Group 3	
	Example 2 - Symmetric Group 4	
	Example 3 - Semiregular or Free Action (Id is only Stabilizer)	
	Example 4 - Direct Product	
	Local function: orbitWithSvc	
	Local function CosetRep1	

Local function strip1	. 2719
Local function bsgs	. 2720
Local function bsgs1	. 2721
PermutationGroup (PERMGRP)	. 2749
domain HACKPI Pi	. 2789
Pi (HACKPI)	. 2791
domain ACPLOT PlaneAlgebraicCurvePlot	
PlaneAlgebraicCurvePlot (ACPLOT)	
domain PLACES Places	. 2850
Places (PLACES)	. 2852
$domain\ PLACESPS\ Places Over Pseudo Algebraic Closure Of Finite Field \\ \ldots \ldots$. 2853
PlacesOverPseudoAlgebraicClosureOfFiniteField (PLACESPS)	. 2854
domain PLCS Plcs	. 2855
Plcs (PLCS)	. 2856
domain PLOT Plot	. 2862
Plot (PLOT)	. 2865
domain PLOT3D Plot3D	. 2885
Plot3D (PLOT3D)	. 2886
domain PBWLB PoincareBirkhoffWittLyndonBasis	. 2904
PoincareBirkhoffWittLyndonBasis (PBWLB)	
domain POINT Point	
Point (POINT)	
domain POLY Polynomial	
Polynomial (POLY)	
domain IDEAL PolynomialIdeals	
PolynomialIdeals (IDEAL)	
domain PR PolynomialRing	
PolynomialRing (PR)	
domain PI PositiveInteger	
PositiveInteger (PI)	
domain PF PrimeField	
PrimeField (PF)	
domain PRIMARR PrimitiveArray	
PrimitiveArray (PRIMARR)	
domain PRODUCT Product	
Product (PRODUCT)	
domain PROJPL ProjectivePlane	
ProjectivePlane (PROJPL)	
domain PROJPLPS ProjectivePlaneOverPseudoAlgebraicClosureOfFiniteField .	
ProjectivePlaneOverPseudoAlgebraicClosureOfFiniteField (PROJPLPS)	
domain PROJSP ProjectiveSpace	. 2989
ProjectiveSpace (PROJSP)	
domain PACEXT PseudoAlgebraicClosureOfAlgExtOfRationalNumber	
PseudoAlgebraicClosureOfAlgExtOfRationalNumber (PACEXT)	
domain PACOFF PseudoAlgebraicClosureOfFiniteField	
Pseudo Algebraic Closure Of Finite Field (PACOFF)	3013

CONTENTS	2	03

domain PACRAT Pseudo Algebraic Closure OfRational Number	
	043
domain QFORM QuadraticForm	3043
QuadraticForm (QFORM)	3044
domain QALGSET QuasiAlgebraicSet	3046
QuasiAlgebraicSet (QALGSET)	3047
domain QUAT Quaternion	3054
Quaternion (QUAT)	3060
domain QEQUAT QueryEquation	
QueryEquation (QEQUAT)	
domain QUEUE Queue	
Queue (QUEUE)	
19 Chapter R 3	085
domain RADFF RadicalFunctionField	3085
RadicalFunctionField (RADFF)	
domain RADIX RadixExpansion	
RadixExpansion (RADIX)	
domain RECLOS RealClosure	
RealClosure (RECLOS)	
domain RMATRIX RectangularMatrix	
RectangularMatrix (RMATRIX)	
domain REF Reference	
Reference (REF)	
domain RGCHAIN RegularChain	
RegularChain (RGCHAIN)	
domain REGSET RegularTriangularSet	
RegularTriangularSet (REGSET)	
domain RESRING ResidueRing	
ResidueRing (RESRING)	
domain RESULT Result	
Result (RESULT)	
domain RULE RewriteRule	
RewriteRule (RULE)	
domain ROIRC RightOpenIntervalRootCharacterization	
Ü -	
RightOpenIntervalRootCharacterization (ROIRC)	
RomanNumeral (ROMAN)	
,	
domain ROUTINE RoutinesTable	
RoutinesTable (ROUTINE)	
domain RULECOLD RuleCalled	
RuleCalled (RULECOLD)	
domain RULESET Ruleset	
Ruleset (RULESET)	3279

20	Chapter S	3283
	domain FORMULA ScriptFormulaFormat	. 3283
	ScriptFormulaFormat (FORMULA)	. 3284
	domain SEG Segment	. 3299
	Segment (SEG)	. 3303
	domain SEGBIND SegmentBinding	
	SegmentBinding (SEGBIND)	
	domain SET Set	
	Set (SET)	
	domain SETMN SetOfMIntegersInOneToN	
	SetOfMIntegersInOneToN (SETMN)	
	domain SDPOL SequentialDifferentialPolynomial	
	SequentialDifferentialPolynomial (SDPOL)	
	domain SDVAR SequentialDifferentialVariable	
	SequentialDifferentialVariable (SDVAR)	
	domain SEX SExpression	
	SExpression (SEX)	
	domain SEXOF SExpressionOf	
	SExpressionOf (SEXOF)	
	domain SAE SimpleAlgebraicExtension	
	SimpleAlgebraicExtension (SAE)	
	domain SCELL SimpleCell	
	SimpleCell (SCELL)	
	domain SFORT SimpleFortranProgram	
	SimpleFortranProgram (SFORT)	
	domain SINT SingleInteger	
	SingleInteger (SINT)	
	domain SAOS SingletonAsOrderedSet	
	SingletonAsOrderedSet (SAOS)	
	domain SEM SparseEchelonMatrix	
	SparseEchelonMatrix (SEM)	
	$\label{lem:continuous} domain \ SMP \ Sparse Multivariate Polynomial \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	
	SparseMultivariatePolynomial (SMP)	
	${\it domain SMTS Sparse Multivariate Taylor Series } \ldots \ldots \ldots \ldots \ldots \ldots$	
	SparseMultivariateTaylorSeries (SMTS)	
	domain STBL SparseTable	
	SparseTable (STBL)	
	${\it domain SULS Sparse Univariate Laurent Series} $	
	SparseUnivariateLaurentSeries (SULS)	
	${\it domain SUP Sparse Univariate Polynomial} \ \dots $. 3484
	SparseUnivariatePolynomial (SUP)	. 3489
	domain SUPEXPR SparseUnivariatePolynomialExpressions	
	SparseUnivariatePolynomialExpressions (SUPEXPR)	
	domain SUPXS SparseUnivariatePuiseuxSeries	
	SparseUnivariatePuiseuxSeries (SUPXS)	
	domain ORESUP SparseUnivariateSkewPolynomial	

CONTENTS	205
----------	-----

	Change University Cherry Delumental (ODECUD)	9	1501
	SparseUnivariateSkewPolynomial (ORESUP)		
C	lomain SUTS SparseUnivariateTaylorSeries	. ქ	5523
	SparseUnivariateTaylorSeries (SUTS)		
C	lomain SHDP SplitHomogeneousDirectProduct	. 3	3543
	SplitHomogeneousDirectProduct (SHDP)		
C	domain SPLNODE SplittingNode		
	SplittingNode (SPLNODE)		
C	lomain SPLTREE SplittingTree		
	SplittingTree (SPLTREE)	. 3	8557
Ċ	lomain SREGSET SquareFreeRegularTriangularSet	. 3	8569
	SquareFreeRegularTriangularSet (SREGSET)	. 3	8580
Ċ	lomain SQMATRIX SquareMatrix	. 3	8597
	SquareMatrix (SQMATRIX)		
Ċ	lomain STACK Stack		
	Stack (STACK)		
ć	lomain SD StochasticDifferential		
	Stochastic Differential (SD)		
ć	lomain STREAM Stream		
	Stream (STREAM)		
ć	lomain STRING String		
	String (STRING)		
	lomain STRTBL StringTable		
C			
_	StringTable (STRTBL)		
C	lomain SUBSPACE SubSpace		
	SubSpace (SUBSPACE)		
C	lomain COMPPROP SubSpaceComponentProperty		
	SubSpaceComponentProperty (COMPPROP)		
C	lomain SUCH SuchThat		
	SuchThat (SUCH)		
C	lomain SWITCH Switch		
	Switch (SWITCH)		
C	lomain SYMBOL Symbol		
	Symbol (SYMBOL)	. 3	3722
Ċ	lomain SYMTAB SymbolTable	. 3	8736
	SymbolTable (SYMTAB)	. 3	3737
Ċ	lomain SYMPOLY SymmetricPolynomial	. 3	8744
	SymmetricPolynomial (SYMPOLY)		
	v v v		
21 (Chapter T	37	49
Ċ	lomain TABLE Table	. 3	8749
	Table (TABLE)	. 3	3756
Ċ	lomain TABLEAU Tableau		
	Tableau (TABLEAU)		
Ċ	lomain TS TaylorSeries		
	TaylorSeries (TS)		
ć	lomain TEX TexFormat		
_			

	TexFormat (TEX)				. 37	
	$\operatorname{TextOrmat}(\operatorname{TEA})$		-	-		70
	domain TEXTFILE TextFile				. 379	90
	TextFile (TEXTFILE)				. 379	94
	domain SYMS TheSymbol Table				. 379	98
	TheSymbolTable (SYMS)				. 379	99
	domain M3D ThreeDimensionalMatrix					
	ThreeDimensionalMatrix (M3D)				. 380	98
	domain VIEW3D ThreeDimensionalViewport					
	ThreeDimensionalViewport (VIEW3D)					
	domain SPACE3 ThreeSpace					
	ThreeSpace (SPACE3)					
	domain TREE Tree					
	Tree (TREE)					
	domain TUBE TubePlot					
	TubePlot (TUBE)					
	domain TUPLE Tuple					
	Tuple (TUPLE)					
	domain ARRAY2 TwoDimensional Array					
	TwoDimensionalArray (ARRAY2)					
	domain VIEW2D TwoDimensionalViewport					
	domain vie vieb i wobinicipionar viewport					
	TwoDimensionalViewport (VIEW2D)					16
	TwoDimensionalViewport (VIEW2D)					96
22	TwoDimensionalViewport (VIEW2D)					
	- , ,				. 390 392 9	9
	Chapter U domain UFPS UnivariateFormalPowerSeries	 			. 390 392 9 . 392	9 29
	Chapter U domain UFPS UnivariateFormalPowerSeries	 			3929 3929 393	9 29 32
	Chapter U domain UFPS UnivariateFormalPowerSeries	 			3929 3929 393 393	9 29 32 33
	Chapter U domain UFPS UnivariateFormalPowerSeries				3929 3929 393 393 393	9 29 32 33
	Chapter U domain UFPS UnivariateFormalPowerSeries				. 390 3929 . 393 . 393 . 394	9 29 32 33 39 42
	Chapter U domain UFPS UnivariateFormalPowerSeries				. 390 3929 . 393 . 393 . 394 . 394	9 29 32 33 39 42
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial				. 390 3929 . 393 . 393 . 394 . 394	9 29 32 33 39 42 47
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP)				. 390 3929 . 393 . 393 . 394 . 394 . 396 . 396	9 29 32 33 39 42 47 67
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP) domain UPXS UnivariatePuiseuxSeries				. 390 3929 . 393 . 393 . 394 . 394 . 398 . 398	9 29 32 33 39 42 47 67 83 86
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP) domain UPXS UnivariatePuiseuxSeries UnivariatePuiseuxSeries (UPXS)				3929 3929 393 393 394 394 396 398	9 29 32 33 39 42 47 67 83 86 89
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP) domain UPXS UnivariatePuiseuxSeries UnivariatePuiseuxSeries (UPXS) domain UPXSCONS UnivariatePuiseuxSeriesConstructor				. 390 3929 . 393 . 393 . 394 . 396 . 398 . 398 . 398	9 29 32 33 39 42 47 83 86 89
	Chapter U domain UFPS UnivariateFormalPowerSeries				. 390 3929 . 393 . 393 . 394 . 396 . 398 . 398 . 398 . 398	9 29 32 33 39 42 47 83 86 89 95
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP) domain UPXS UnivariatePuiseuxSeries UnivariatePuiseuxSeries (UPXS) domain UPXSCONS UnivariatePuiseuxSeriesConstructor UnivariatePuiseuxSeriesConstructor (UPXSCONS) domain UPXSSING UnivariatePuiseuxSeriesWithExponentialSingularity				3929 3929 3920 3930 3940 3940 3950 3950 3950 3950 3950 3950 3950 395	9 32 33 39 42 47 67 83 86 89 95
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP) domain UPXS UnivariatePuiseuxSeries UnivariatePuiseuxSeries (UPXS) domain UPXSCONS UnivariatePuiseuxSeriesConstructor UnivariatePuiseuxSeriesConstructor (UPXSCONS) domain UPXSSING UnivariatePuiseuxSeriesWithExponentialSingularity UnivariatePuiseuxSeriesWithExponentialSingularity				3929 3929 3920 3930 3940 3950 3950 3950 3950 3950 3950 3950 395	9 32 33 39 42 47 83 86 89 95 14
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP) domain UPXS UnivariatePuiseuxSeries UnivariatePuiseuxSeries (UPXS) domain UPXSCONS UnivariatePuiseuxSeriesConstructor UnivariatePuiseuxSeriesConstructor (UPXSCONS) domain UPXSSING UnivariatePuiseuxSeriesWithExponentialSingularity UnivariatePuiseuxSeriesWithExponentialSingularity (UPXSSING) domain OREUP UnivariateSkewPolynomial				3929 3929 3929 3940 3940 3940 3950 3960 3960 3970 4070 4070 4070 4070 4070 4070 4070 4	9 32 33 39 42 47 67 86 89 95 14 16 27
	Chapter U domain UFPS UnivariateFormalPowerSeries UnivariateFormalPowerSeries (UFPS) domain ULS UnivariateLaurentSeries UnivariateLaurentSeries (ULS) domain ULSCONS UnivariateLaurentSeriesConstructor UnivariateLaurentSeriesConstructor (ULSCONS) domain UP UnivariatePolynomial UnivariatePolynomial (UP) domain UPXS UnivariatePuiseuxSeries UnivariatePuiseuxSeries (UPXS) domain UPXSCONS UnivariatePuiseuxSeriesConstructor UnivariatePuiseuxSeriesConstructor (UPXSCONS) domain UPXSCONS UnivariatePuiseuxSeriesWithExponentialSingularity UnivariatePuiseuxSeriesWithExponentialSingularity UnivariatePuiseuxSeriesWithExponentialSingularity UnivariateSkewPolynomial UnivariateSkewPolynomial UnivariateSkewPolynomial (OREUP)				3929 3929 3929 3939 3940 3950 3960 3960 3960 4070 4070 4070 4070 4070 4070 4070 40	9 32 33 39 42 47 67 86 89 95 14 16 27
	Chapter U domain UFPS UnivariateFormalPowerSeries				3929 3929 3929 3940 3940 3940 3990 3990 400 400 400 400 400	9 29 32 39 42 47 67 86 89 95 14 16 27
	Chapter U domain UFPS UnivariateFormalPowerSeries				3929 3929 3929 3939 3940 3940 3990 3990 400 400 400 400 400	9 29 32 33 42 47 67 83 95 95 94 14 44
	Chapter U domain UFPS UnivariateFormalPowerSeries				3929 3929 3929 3939 3940 3940 3999 3990 400 400 400 400 400 400	9 29 32 33 39 42 47 83 86 89 95 14 41 44 44
	Chapter U domain UFPS UnivariateFormalPowerSeries				3929 3929 3929 3939 3940 3999 3999 3999 3999 400 400 400 400 400 400 400	9 32 33 33 42 47 67 83 86 89 14 16 27 39 41 44 56

CONTENTS	207
CONTENTS	207

26 Cl	hapter Y	42
	XRecursivePolynomial (XRPOLY)	• • 4
do	main XRPOLY XRecursivePolynomial	
	XPolynomialRing (XPR)	
do	main XPR XPolynomialRing	
	XPolynomial (XPOLY)	
do	main XPOLY XPolynomial	
	XPBWPolynomial (XPBWPOLY)	
do	main XPBWPOLY XPBWPolynomial	
	XDistributedPolynomial (XDPOLY)	
do	main XDPOLY XDistributedPolynomial	
	hapter X	41
	WuWenTsunTriangularSet (WUTSET)	
do	main WUTSET WuWenTsunTriangularSet	4
	WeightedPolynomials (WP)	4
do	main WP WeightedPolynomials	4
24 Cl	hapter W	41
	Void (VOID)	4
do	main VOID Void	4
	Vector (VECTOR)	4
do	main VECTOR Vector	4
	Variable (VARIABLE)	4
do	main VARIABLE Variable	4
23 Cl	hapter V	41
	U32Vector (U32VEC)	4
do	main U32VEC U32Vector	4
	U16Vector (U16VEC)	
do	main U16VEC U16Vector	4
	U8Vector (U8VEC)	
do	main U8VEC U8Vector	
	U32Matrix (U32MAT)	4
do	main U32MAT U32Matrix	
	U16Matrix (U16MAT)	
ao	main U16MAT U16Matrix	4
do	U8Matrix (U8MAT)	

2 8	The bootstrap code	-	1229
	BOOLEAN.lsp		4229
	CHAR.lsp BOOTSTRAP		4234
	DFLOAT.lsp BOOTSTRAP		4238
	ILIST.lsp BOOTSTRAP		
	INT.lsp BOOTSTRAP		
	ISTRING.lsp BOOTSTRAP		4277
	LIST.lsp BOOTSTRAP		
	NNI.lsp BOOTSTRAP		
	OUTFORM.lsp BOOTSTRAP		
	PI.lsp BOOTSTRAP		
	PRIMARR.lsp BOOTSTRAP		
	REF.lsp BOOTSTRAP		
	SINT.lsp BOOTSTRAP		
	SYMBOL.lsp BOOTSTRAP		
	VECTOR.lsp BOOTSTRAP		
29	Chunk collections	4	1355
Bi	bliography	4	1373
In	dex chapter*.923	4	1387

Volume 10.4: Axiom Algebra: Packages

1	Chapter Overview	1
2	Chapter A	3
	$package\ AFALGGRO\ Affine Algebraic Set Compute With Groebner Basis \\ \ \dots \\ \ \dots$	3
	$Affine Algebraic Set Compute With Groebner Basis \; (AFALGGRO) \;\; \dots \;\; \dots \;\; \dots$	4
	$package\ AFALGRES\ Affine Algebraic Set Compute With Resultant \\ \dots \dots \dots \dots$	10
	$Affine Algebraic Set Compute With Resultant \; (AFALGRES) \;\; \dots \;\;$	11
	package AF AlgebraicFunction	17
	AlgebraicFunction (AF)	18
	package INTHERAL AlgebraicHermiteIntegration	27
	AlgebraicHermiteIntegration (INTHERAL)	27
	package INTALG AlgebraicIntegrate	31
	AlgebraicIntegrate (INTALG)	32
	package INTAF AlgebraicIntegration	43
	AlgebraicIntegration (INTAF)	44
	package ALGMANIP AlgebraicManipulations	47
	AlgebraicManipulations (ALGMANIP)	49
	package ALGMFACT AlgebraicMultFact	56
	AlgebraicMultFact (ALGMFACT)	57
	package ALGPKG AlgebraPackage	59
	AlgebraPackage (ALGPKG)	60
	package ALGFACT AlgFactor	76
	AlgFactor (ALGFACT)	77
	package INTPACK AnnaNumericalIntegrationPackage	81
	AnnaNumericalIntegrationPackage (INTPACK)	82
	package OPTPACK AnnaNumericalOptimizationPackage	97
	AnnaNumericalOptimizationPackage (OPTPACK)	98
	$package\ ODEPACK\ Anna Ordinary Differential Equation Package\ .\ .\ .\ .\ .\ .$	
	$Anna Ordinary Differential Equation Package \ (ODEPACK) \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	
	package PDEPACK AnnaPartialDifferentialEquationPackage	
	$\label{eq:annaPartialDifferentialEquationPackage} Anna Partial Differential Equation Package \ (PDEPACK) \ \dots \dots \dots \dots \dots$	
	package ANY1 AnyFunctions1	
	AnyFunctions1 (ANY1)	133
	package API ApplicationProgramInterface	
	ApplicationProgramInterface (API)	
	package APPRULE ApplyRules	
	ApplyRules (APPRULE)	145
	package APPLYORE ApplyUnivariateSkewPolynomial	150
	ApplyUnivariateSkewPolynomial (APPLYORE)	151
	package ASSOCEQ AssociatedEquations	
	AssociatedEquations (ASSOCEQ)	
	package PMPRED AttachPredicates	
	AttachPredicates (PMPRED)	

	package AXSERV AxiomServer		 		 160
	AxiomServer (AXSERV)		 		 161
3	Chapter B				185
J	package BALFACT BalancedFactorisation				
	BalancedFactorisation (BALFACT)				
	package BOP1 BasicOperatorFunctions1				
	BasicOperatorFunctions1 (BOP1)				
	package BEZIER Bezier				
	Bezier (BEZIER)				
	package BEZOUT BezoutMatrix				
	BezoutMatrix (BEZOUT)				
	package BLUPPACK BlowUpPackage				
	BlowUpPackage (BLUPPACK)				
	package BOUNDZRO BoundIntegerRoots				
	BoundIntegerRoots (BOUNDZRO)				
	package BRILL BrillhartTests				
	BrillhartTests (BRILL)	•	 	•	 220
4	Chapter C				233
	package CARTEN2 CartesianTensorFunctions2		 		 233
	CartesianTensorFunctions2 (CARTEN2)				
	package CHVAR ChangeOfVariable		 		 235
	ChangeOfVariable (CHVAR)		 		 236
	package CPIMA CharacteristicPolynomialInMonogenicalAlgebra		 		 241
	CharacteristicPolynomialInMonogenicalAlgebra (CPIMA)		 		 242
	package CHARPOL CharacteristicPolynomialPackage		 		 244
	CharacteristicPolynomialPackage (CHARPOL)		 		 245
	package IBACHIN ChineseRemainderToolsForIntegralBases				
	ChineseRemainderToolsForIntegralBases (IBACHIN)				
	package CVMP CoerceVectorMatrixPackage				
	CoerceVectorMatrixPackage (CVMP)				
	package COMBF CombinatorialFunction				
	CombinatorialFunction (COMBF)				
	package CDEN CommonDenominator				
	CommonDenominator (CDEN)				
	package COMMONOP CommonOperators				
	CommonOperators (COMMONOP)				
	package COMMUPC CommuteUnivariatePolynomialCategory				
	CommuteUnivariatePolynomialCategory (COMMUPC)	•	 	•	 $\frac{294}{294}$
	package COMPFACT ComplexFactorization				
	ComplexFactorization (COMPFACT)				
	package COMPLEX2 ComplexFunctions2				
	ComplexFunctions2 (COMPLEX2)				
	package CINTSLPE ComplexIntegerSolveLinearPolynomialEquation				
	ComplexIntegerSolveLinearPolynomialEquation (CINTSLPE).				
	Complexintegersolvermeari olynomiairequation (CINTSLPE).	•	 	•	 909

package COMPLPAT ComplexPattern	305
ComplexPattern (COMPLPAT)	
package CPMATCH ComplexPatternMatch	307
ComplexPatternMatch (CPMATCH)	
package CRFP ComplexRootFindingPackage	
ComplexRootFindingPackage (CRFP)	
package CMPLXRT ComplexRootPackage	
ComplexRootPackage (CMPLXRT)	
package CTRIGMNP ComplexTrigonometricManipulations	
ComplexTrigonometricManipulations (CTRIGMNP)	
package ODECONST ConstantLODE	340
ConstantLODE (ODECONST)	341
package COORDSYS CoordinateSystems	
CoordinateSystems (COORDSYS)	
package CRAPACK CRApackage	
CRApackage (CRAPACK)	
package CYCLES CycleIndicators	
CycleIndicators (CYCLES)	
package CSTTOOLS CyclicStreamTools	
CyclicStreamTools (CSTTOOLS)	
package CYCLOTOM CyclotomicPolynomialPackage	
CyclotomicPolynomialPackage (CYCLOTOM)	
package CAD CylindricalAlgebraicDecompositionPackage	
CylindricalAlgebraicDecompositionPackage (CAD)	390
package CADU CylindricalAlgebraicDecompositionUtilities	
CylindricalAlgebraicDecompositionUtilities (CADU)	
, and the second	
Chapter D	399
package DFINTTLS DefiniteIntegrationTools	
DefiniteIntegrationTools (DFINTTLS)	
package DEGRED DegreeReductionPackage	
DegreeReductionPackage (DEGRED)	
package DTP DesingTreePackage	
DesingTreePackage (DTP)	
package DIOSP DiophantineSolutionPackage	427
DiophantineSolutionPackage (DIOSP)	428
package DIRPROD2 DirectProductFunctions2	
DirectProductFunctions2 (DIRPROD2)	
package DLP DiscreteLogarithmPackage	
DiscreteLogarithmPackage (DLP)	
package DISPLAY DisplayPackage	
DisplayPackage (DISPLAY)	
package DDFACT DistinctDegreeFactorize	
DistinctDegreeFactorize (DDFACT)	
package DFSFUN DoubleFloatSpecialFunctions	
DoubleFloatSpecialFunctions (DFSFUN)	470

5

	The Gamma Function	475
	The Exponential Integral	475
	$\text{En:}(\text{PI,R}) \rightarrow \text{OPR}$	481
	The Ei Function	481
	The Fresnel Integral $[?,?]$	504
	The logGamma Function	
	package DBLRESP DoubleResultantPackage	
	DoubleResultantPackage (DBLRESP)	512
	package DRAWCX DrawComplex	
	DrawComplex (DRAWCX)	515
	package DRAWHACK DrawNumericHack	
	DrawNumericHack (DRAWHACK)	523
	package DROPT0 DrawOptionFunctions0	
	DrawOptionFunctions0 (DROPT0)	
	package DROPT1 DrawOptionFunctions1	
	DrawOptionFunctions1 (DROPT1)	
	package D01AGNT d01AgentsPackage	
	d01AgentsPackage (D01AGNT)	
	package D01WGTS d01WeightsPackage	
	d01WeightsPackage (D01WGTS)	
	package D02AGNT d02AgentsPackage	
	d02AgentsPackage (D02AGNT)	
	package D03AGNT d03AgentsPackage	
	d03AgentsPackage (D03AGNT)	624
6	Chapter E	629
	package EP EigenPackage	629
	EigenPackage (EP)	630
	package EF ElementaryFunction	639
	ElementaryFunction (EF)	650
	package DEFINTEF ElementaryFunctionDefiniteIntegration	688
	ElementaryFunctionDefiniteIntegration (DEFINTEF)	689
	package LODEEF ElementaryFunctionLODESolver	697
	ElementaryFunctionLODESolver (LODEEF)	
	package ODEEF ElementaryFunctionODESolver	708
	ElementaryFunctionODESolver (ODEEF)	
	package SIGNEF ElementaryFunctionSign	718
	ElementaryFunctionSign (SIGNEF)	719
	package EFSTRUC ElementaryFunctionStructurePackage	726
	ElementaryFunctionStructurePackage (EFSTRUC)	727
	package INTEF ElementaryIntegration	742
	ElementaryIntegration (INTEF)	743
	package RDEEF ElementaryRischDÉ	757
	ElementaryRischDE (RDEEF)	758
	ElementaryRischDE (RDEEF)	

package ELFUTS EllipticFunctionsUnivariateTaylorSeries	
EllipticFunctionsUnivariateTaylorSeries (ELFUTS)	
package EQ2 EquationFunctions2	
EquationFunctions2 (EQ2)	
package ERROR ErrorFunctions	
ErrorFunctions (ERROR)	
package GBEUCLID EuclideanGroebnerBasisPackage	
EuclideanGroebnerBasisPackage (GBEUCLID) 806	
package EVALCYC EvaluateCycleIndicators	
EvaluateCycleIndicators (EVALCYC)	
package ESCONT ExpertSystemContinuityPackage	
ExpertSystemContinuityPackage (ESCONT) 829	
package ESCONT1 ExpertSystemContinuityPackage1	
ExpertSystemContinuityPackage1 (ESCONT1)	
package ESTOOLS ExpertSystemToolsPackage	
ExpertSystemToolsPackage (ESTOOLS)	
package ESTOOLS1 ExpertSystemToolsPackage1	
ExpertSystemToolsPackage1 (ESTOOLS1)	
package ESTOOLS2 ExpertSystemToolsPackage2	
ExpertSystemToolsPackage2 (ESTOOLS2)	
package EXPR2 ExpressionFunctions2	
ExpressionFunctions2 (EXPR2)	
package EXPRSOL ExpressionSolve	
Bugs	
ExpressionSolve (EXPRSOL)	
package ES1 ExpressionSpaceFunctions1	
ExpressionSpaceFunctions1 (ES1)	
package ES2 ExpressionSpaceFunctions2	
ExpressionSpaceFunctions2 (ES2)	
package EXPRODE ExpressionSpaceODESolver	
ExpressionSpaceODESolver (EXPRODE)	
package OMEXPR ExpressionToOpenMath	
ExpressionToOpenMath (OMEXPR)	
package EXPR2UPS ExpressionToUnivariatePowerSeries 890	
ExpressionToUnivariatePowerSeries (EXPR2UPS) 891	
package EXPRTUBE ExpressionTubePlot	
ExpressionTubePlot (EXPRTUBE)	
package EXP3D Export3D	
Export3D (EXP3D)	
package E04AGNT e04AgentsPackage	
e04AgentsPackage (E04AGNT)	

7	Chapter F	927
	package FACTFUNC FactoredFunctions	927
	FactoredFunctions (FACTFUNC)	
	package FR2 FactoredFunctions2	
	FactoredFunctions2 (FR2)	
	package FRUTIL FactoredFunctionUtilities	
	FactoredFunctionUtilities (FRUTIL)	
	package FACUTIL FactoringUtilities	
	FactoringUtilities (FACUTIL)	
	package FACTEXT FactorisationOverPseudoAlgebraicClosureOfAlgExtOfRational-	
	Number	
	$Factorisation Over Pseudo Algebraic Closure Of Alg Ext Of Rational Number\ (FAC-1) and the contraction of $	
	TEXT)	943
	${\tt package\ FACTRN\ factorisation Over Pseudo Algebraic Closure Of Rational Number\ .\ .}$	
	FactorisationOverPseudoAlgebraicClosureOfRationalNumber (FACTRN)	
	package FGLMICPK FGLMIfCanPackage	
	FGLMIfCanPackage (FGLMICPK)	
	package FORDER FindOrderFinite	
	FindOrderFinite (FORDER)	
	package FAMR2 FiniteAbelianMonoidRingFunctions2	
	FiniteAbelianMonoidRingFunctions2 (FAMR2)	
	package FDIV2 FiniteDivisorFunctions2	
	FiniteDivisorFunctions2 (FDIV2)	
	package FFFACTOR FiniteFieldFactorization	
	FiniteFieldFactorization (FFFACTOR)	
	package FFFACTSE FiniteFieldFactorizationWithSizeParseBySideEffect	
	FiniteFieldFactorizationWithSizeParseBySideEffect (FFFACTSE)	
	package FFF FiniteFieldFunctions	985
	FiniteFieldFunctions (FFF)	
	package FFHOM FiniteFieldHomomorphisms	
	FiniteFieldHomomorphisms (FFHOM)	995
	package FFPOLY FiniteFieldPolynomialPackage	1008
	FiniteFieldPolynomialPackage (FFPOLY)	1009
	package FFPOLY2 FiniteFieldPolynomialPackage2	1042
	FiniteFieldPolynomialPackage2 (FFPOLY2)	1043
	package FFSLPE FiniteFieldSolveLinearPolynomialEquation	
	$Finite Field Solve Linear Polynomial Equation \ (FFSLPE) \ \dots \dots \dots \dots \dots$	1048
	package FFSQFR FiniteFieldSquareFreeDecomposition	
	FiniteFieldSquareFreeDecomposition (FFSQFR)	
	package FLAGG2 FiniteLinearAggregateFunctions2	
	$Finite Linear Aggregate Functions 2 \ (FLAGG2) \ \dots $	
	package FLASORT FiniteLinearAggregateSort	
	FiniteLinearAggregateSort (FLASORT)	
	package FSAGG2 FiniteSetAggregateFunctions2	
	$FiniteSetAggregateFunctions 2 \ (FSAGG2) \ \dots $	
	package FLOATCP FloatingComplexPackage	1069

	package FS2EXPXP FunctionSpaceToExponentialExpansion
	FunctionSpaceToExponentialExpansion (FS2EXPXP)
	package FS2UPS FunctionSpaceToUnivariatePowerSeries
	FunctionSpaceToUnivariatePowerSeries (FS2UPS)
	package FSUPFACT FunctionSpaceUnivariatePolynomialFactor
	FunctionSpaceUnivariatePolynomialFactor (FSUPFACT)
8	Chapter G 1243
	package GALFACTU GaloisGroupFactorizationUtilities
	GaloisGroupFactorizationUtilities (GALFACTU)
	package GALFACT GaloisGroupFactorizer
	GaloisGroupFactorizer (GALFACT)
	package GALPOLYU GaloisGroupPolynomialUtilities
	GaloisGroupPolynomialUtilities (GALPOLYU)
	package GALUTIL GaloisGroupUtilities
	GaloisGroupUtilities (GALUTIL)
	package GAUSSFAC GaussianFactorizationPackage
	GaussianFactorizationPackage (GAUSSFAC)
	package GHENSEL GeneralHenselPackage
	GeneralHenselPackage (GHENSEL)
	package GENMFACT GeneralizedMultivariateFactorize
	GeneralizedMultivariateFactorize (GENMFACT)
	package GPAFF GeneralPackageForAlgebraicFunctionField
	GeneralPackageForAlgebraicFunctionField (GPAFF)
	package GENPGCD GeneralPolynomialGcdPackage
	GeneralPolynomialGcdPackage (GENPGCD)
	package GENUPS GenerateUnivariatePowerSeries
	GenerateUnivariatePowerSeries (GENUPS)
	package GENEEZ GenExEuclid
	GenExEuclid (GENEEZ)
	package GENUFACT GenUFactorize
	GenUFactorize (GENUFACT)
	package INTG0 GenusZeroIntegration
	GenusZeroIntegration (INTG0)
	package GDRAW GnuDraw
	GnuDraw (GDRAW)
	package GOSPER GosperSummationMethod
	GosperSummationMethod (GOSPER)
	package GRDEF GraphicsDefaults
	GraphicsDefaults (GRDEF)
	package GRAPHVIZ Graphviz
	Graphviz (GRAPHVIZ)
	package GRAY GrayCode
	GrayCode (GRAY)
	package GBF GroebnerFactorizationPackage
	GroebnerFactorizationPackage (GBF) 1411

CONTENTS	217

CONTENTS	217
package GBINTERN GroebnerInternalPackage	1423
GroebnerInternalPackage (GBINTERN)	1424
package GB GroebnerPackage	
GroebnerPackage (GB)	
package GROEBSOL GroebnerSolve	
GroebnerSolve (GROEBSOL)	
package GUESS Guess	
Guess (GUESS)	
package GUESSAN GuessAlgebraicNumber	
GuessAlgebraicNumber (GUESSAN)	
package GUESSF GuessFinite	
GuessFinite (GUESSF)	
package GUESSF1 GuessFiniteFunctions	
GuessFiniteFunctions (GUESSF1)	
· · · · · · · · · · · · · · · · · · ·	
package GUESSINT GuessInteger	
GuessInteger (GUESSINT)	
package GUESSP GuessPolynomial	
GuessPolynomial (GUESSP)	
package GUESSUP GuessUnivariatePolynomial	
GuessUnivariatePolynomial (GUESSUP)	1528
O Chapter H	1533
package HB HallBasis	1533
HallBasis (HB)	1534
HallBasis (HB)	1534 1537
HallBasis (HB)	1534 1537
HallBasis (HB)	1534 1537
HallBasis (HB)	1534 1537 1538 1547
HallBasis (HB)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODPF)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODPF) package ITFUN2 InfiniteTupleFunctions2	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODPF) package ITFUN2 InfiniteTupleFunctions2 InfiniteTupleFunctions2 (ITFUN2)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODPF) package ITFUN2 InfiniteTupleFunctions2 InfiniteTupleFunctions2 (ITFUN2) package ITFUN3 InfiniteTupleFunctions3	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODPF) package ITFUN2 InfiniteTupleFunctions2 InfiniteTupleFunctions2 (ITFUN2) package ITFUN3 InfiniteTupleFunctions3 InfiniteTupleFunctions3 (ITFUN3)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODFF) package ITFUN2 InfiniteTupleFunctions2 InfiniteTupleFunctions2 (ITFUN2) package ITFUN3 InfiniteTupleFunctions3 InfiniteTupleFunctions3 (ITFUN3) package INFINITY Infinity	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODFF) package ITFUN2 InfiniteTupleFunctions2 InfiniteTupleFunctions2 (ITFUN2) package ITFUN3 InfiniteTupleFunctions3 InfiniteTupleFunctions3 (ITFUN3) package INFINITY Infinity Infinity (INFINITY)	
HallBasis (HB) package HEUGCD HeuGcd HeuGcd (HEUGCD) 10 Chapter I package IDECOMP IdealDecompositionPackage IdealDecompositionPackage (IDECOMP) package INCRMAPS IncrementingMaps IncrementingMaps (INCRMAPS) package INFPROD0 InfiniteProductCharacteristicZero InfiniteProductCharacteristicZero (INFPROD0) package INPRODFF InfiniteProductFiniteField InfiniteProductFiniteField (INPRODFF) package INPRODPF InfiniteProductPrimeField InfiniteProductPrimeField (INPRODFF) package ITFUN2 InfiniteTupleFunctions2 InfiniteTupleFunctions2 (ITFUN2) package ITFUN3 InfiniteTupleFunctions3 InfiniteTupleFunctions3 (ITFUN3) package INFINITY Infinity	

package ICDEN InnerCommonDenominator	1586
InnerCommonDenominator (ICDEN)	1587
package IMATLIN InnerMatrixLinearAlgebraFunctions	1589
InnerMatrixLinearAlgebraFunctions (IMATLIN)	
$package\ IMATQF\ InnerMatrix Quotient Field Functions\ \dots\dots\dots\dots\dots\dots$	1598
InnerMatrixQuotientFieldFunctions (IMATQF)	
package INMODGCD InnerModularGcd	1601
InnerModularGcd (INMODGCD)	
package INNMFACT InnerMultFact	1608
InnerMultFact (INNMFACT)	1609
package INBFF InnerNormalBasisFieldFunctions	1624
InnerNormalBasisFieldFunctions (INBFF)	1625
package INEP InnerNumericEigenPackage	1637
InnerNumericEigenPackage (INEP)	1638
package INFSP InnerNumericFloatSolvePackage	1644
InnerNumericFloatSolvePackage (INFSP)	
package INPSIGN InnerPolySign	1652
InnerPolySign (INPSIGN)	
package ISUMP InnerPolySum	
InnerPolySum (ISUMP)	
package ITRIGMNP InnerTrigonometricManipulations	1658
InnerTrigonometricManipulations (ITRIGMNP)	1659
package INFORM1 InputFormFunctions1	1665
InputFormFunctions1 (INFORM1)	1666
package INTERGB InterfaceGroebnerPackage	1668
InterfaceGroebnerPackage (INTERGB)	1669
IntegerBits (INTBIT)	1673
package COMBINAT IntegerCombinatoricFunctions	1674
IntegerCombinatoricFunctions (COMBINAT)	1677
package INTFACT IntegerFactorizationPackage	1682
IntegerFactorizationPackage (INTFACT)	1683
squareFree	
PollardSmallFactor	
BasicSieve	
BasicMethod	
factor	
package ZLINDEP IntegerLinearDependence	
	1695
package INTHEORY IntegerNumberTheoryFunctions	1697
IntegerNumberTheoryFunctions (INTHEORY)	
package PRIMES IntegerPrimesPackage	
IntegerPrimesPackage (PRIMES)	
Rabin-Miller testing	
smallPrimes	
primes	
rabinProvosCompositoSmall	1797

rabinProvesComposite	1728
prime?	1728
nextPrime	1730
prevPrime	1730
package INTRET IntegerRetractions	1737
IntegerRetractions (INTRET)	1738
package IROOT IntegerRoots	1739
IntegerRoots (IROOT)	
perfectSquare?	1742
perfectNthPower?	
perfectNthRoot	1742
approxNthRoot	
perfectNthRoot	
perfectSqrt	
approxSqrt	
package INTSLPE IntegerSolveLinearPolynomialEquation	
IntegerSolveLinearPolynomialEquation (INTSLPE)	
package IBATOOL IntegralBasisTools	
IntegralBasisTools (IBATOOL)	
package IBPTOOLS IntegralBasisPolynomialTools	
IntegralBasisPolynomialTools (IBPTOOLS)	
package IR2 IntegrationResultFunctions2	
IntegrationResultFunctions2 (IR2)	
package IRRF2F IntegrationResultRFToFunction	
IntegrationResultRFToFunction (IRRF2F)	
package IR2F IntegrationResultToFunction	
IntegrationResultToFunction (IR2F)	
package INTTOOLS IntegrationTools	
IntegrationTools (INTTOOLS)	
package IPRNTPK InternalPrintPackage	
InternalPrintPackage (IPRNTPK)	
package IRURPK InternalRationalUnivariateRepresentationPackage	
InternalRationalUnivariateRepresentationPackage (IRURPK)	
package INTFRSP InterpolateFormsPackage	
InterpolateFormsPackage (INTFRSP)	
package INTDIVP IntersectionDivisorPackage	
IntersectionDivisorPackage (INTDIVP)	
package IRREDFFX IrredPolyOverFiniteField	
IrredPolyOverFiniteField (IRREDFFX)	
package IRSN IrrRepSymNatPackage	
IrrRepSymNatPackage (IRSN)	
package INVLAPLA InverseLaplaceTransform	
InverseLaplaceTransform (INVLAPLA)	
inverse Dapiace Transform (Invitation)	1040

 $\boldsymbol{1825}$

11 Chapter J

12 Chapter K	27
package KERNEL2 KernelFunctions2	
KernelFunctions2 (KERNEL2)	
package KOVACIC Kovacic	
Kovacic (KOVACIC)	830
13 Chapter L 183	35
package LAPLACE LaplaceTransform	
LaplaceTransform (LAPLACE)	
package LAZM3PK LazardSetSolvingPackage	
LazardSetSolvingPackage (LAZM3PK)	
package LEADCDET LeadingCoefDetermination	
LeadingCoefDetermination (LEADCDET)	
package LEXTRIPK LexTriangularPackage	
LexTriangularPackage (LEXTRIPK)	
package LINDEP LinearDependence	
LinearDependence (LINDEP)	945
package LODOF LinearOrdinaryDifferentialOperatorFactorizer	
linearOrdinaryDifferentialOperatorFactorizer (LODOF)	
package LODOOPS LinearOrdinaryDifferentialOperatorsOps	
LinearOrdinaryDifferentialOperatorsOps (LODOOPS)	955
package LPEFRAC LinearPolynomialEquationByFractions	
LinearPolynomialEquationByFractions (LPEFRAC)	960
package LISYSER LinearSystemFromPowerSeriesPackage	962
LinearSystemFromPowerSeriesPackage (LISYSER)	963
package LSMP LinearSystemMatrixPackage	966
LinearSystemMatrixPackage (LSMP)	967
package LSMP1 LinearSystemMatrixPackage1	970
LinearSystemMatrixPackage1 (LSMP1)	971
package LSPP LinearSystemPolynomialPackage	
LinearSystemPolynomialPackage (LSPP)	975
package LGROBP LinGroebnerPackage	977
LinGroebnerPackage (LGROBP)	978
package LOP LinesOpPack	990
LinesOpPack (LOP)	991
package LF LiouvillianFunction	995
LiouvillianFunction (LF)	
package LIST2 ListFunctions2	004
ListFunctions2 (LIST2)	005
package LIST3 ListFunctions3	007
ListFunctions3 (LIST3)	008
package LIST2MAP ListToMap	
ListToMap (LIST2MAP)	
package LPARSPT LocalParametrizationOfSimplePointPackage	014
LocalParametrizationOfSimplePointPackage (LPARSPT)	015

14	Chapter M	20	025
	package MKBCFUNC MakeBinaryCompiledFunction		
	MakeBinaryCompiledFunction (MKBCFUNC)		
	package MKFLCFN MakeFloatCompiledFunction		2029
	MakeFloatCompiledFunction (MKFLCFN)		
	package MKFUNC MakeFunction		2034
	MakeFunction (MKFUNC)		2039
	package MKRECORD MakeRecord		2041
	MakeRecord (MKRECORD)		2042
	package MKUCFUNC MakeUnaryCompiledFunction		2043
	MakeUnaryCompiledFunction (MKUCFUNC)		2045
	package MAPHACK1 MappingPackageInternalHacks1		2047
	MappingPackageInternalHacks1 (MAPHACK1)		2048
	package MAPHACK2 MappingPackageInternalHacks2		2049
	MappingPackageInternalHacks2 (MAPHACK2)		2050
	package MAPHACK3 MappingPackageInternalHacks3		2051
	MappingPackageInternalHacks3 (MAPHACK3)		2052
	package MAPPKG1 MappingPackage1		2053
	MappingPackage1 (MAPPKG1)		
	package MAPPKG2 MappingPackage2		2065
	MappingPackage2 (MAPPKG2)		
	package MAPPKG3 MappingPackage3		2075
	MappingPackage3 (MAPPKG3)		
	package MAPPKG4 MappingPackage4		
	MappingPackage4 (MAPPKG4)		2091
	package MATCAT2 MatrixCategoryFunctions2		
	MatrixCategoryFunctions2 (MATCAT2)		
	package MCDEN MatrixCommonDenominator		
	MatrixCommonDenominator (MCDEN)		2098
	package MATLIN MatrixLinearAlgebraFunctions		
	MatrixLinearAlgebraFunctions (MATLIN)		
	package MAMA MatrixManipulation		
	MatrixManipulation (MAMA)		
	package MTHING MergeThing		
	MergeThing (MTHING)		
	package MESH MeshCreationRoutinesForThreeDimensions		
	MeshCreationRoutinesForThreeDimensions (MESH)		2169
	package MDDFACT ModularDistinctDegreeFactorizer		2175
	ModularDistinctDegreeFactorizer (MDDFACT)		2176
	package MHROWRED ModularHermitianRowReduction		
	ModularHermitianRowReduction (MHROWRED)		2185
	package MRF2 MonoidRingFunctions2		
	MonoidRingFunctions2 (MRF2)		
	package MONOTOOL MonomialExtensionTools		
	MonomialExtensionTools (MONOTOOL)		
	package MSYSCMD MoreSystemCommands		2200

	MoreSystemCommands (MSYSCMD)	2202
	package MPCPF MPolyCatPolyFactorizer	
	MPolyCatPolyFactorizer (MPCPF)	2204
	package MPRFF MPolyCatRationalFunctionFactorizer	
	MPolyCatRationalFunctionFactorizer (MPRFF)	2207
	package MPC2 MPolyCatFunctions2	
	MPolyCatFunctions2 (MPC2)	
	package MPC3 MPolyCatFunctions3	2215
	MPolyCatFunctions3 (MPC3)	
	package MRATFAC MRationalFactorize	
	MRationalFactorize (MRATFAC)	
	package MFINFACT MultFiniteFactorize	
	MultFiniteFactorize (MFINFACT)	
	package MMAP MultipleMap	
	MultipleMap (MMAP)	
	package MCALCFN MultiVariableCalculusFunctions	
	MultiVariableCalculusFunctions (MCALCFN)	
	package MULTFACT MultivariateFactorize	
	MultivariateFactorize (MULTFACT)	
	package MLIFT MultivariateLifting	
	package MULTSQFR MultivariateSquareFree	
	MultivariateSquareFree (MULTSQFR)	
	manifement (modification)	2200
15	Chapter N	2273
15	<u>-</u>	
15	package NAGF02 NagEigenPackage	2273
15	package NAGF02 NagEigenPackage	2273 2363
15	package NAGF02 NagEigenPackage	2273 2363 2384
15	package NAGF02 NagEigenPackage	2273 2363 2384 2544
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage .	2273 2363 2384 2544 2565
15	package NAGF02 NagEigenPackage	2273 2363 2384 2544 2565 2655
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage	2273 2363 2384 2544 2565 2655 2669
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP)	2273 2363 2384 2544 2565 2655 2669 2670
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage	2273 2363 2384 2544 2565 2655 2669 2670 2673
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01)	2273 2363 2384 2544 2565 2655 2669 2670 2673 2745
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage	2273 2363 2384 2544 2565 2655 2669 2670 2673 2745 2760
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01)	2273 2363 2384 2544 2565 2655 2669 2670 2673 2745 2760 2813
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack	2273 2363 2384 2544 2565 2669 2670 2673 2745 2760 2813 2824
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07)	2273 2363 2384 2544 2565 2655 2669 2670 2673 2745 2760 2813 2824 2844
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07) package NAGF01 NagMatrixOperationsPackage	2273 2363 2384 2544 2565 2669 2670 2673 2745 2760 2813 2824 2844 2848
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07) package NAGF01 NagMatrixOperationsPackage NagMatrixOperationsPackage (NAGF01)	2273 2363 2384 2544 2565 2655 2669 2670 2745 2760 2813 2824 2844 2848 2924
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07) package NAGF01 NagMatrixOperationsPackage NagMatrixOperationsPackage (NAGF01) package NAGE04 NagOptimisationPackage	2273 2363 2384 2544 2565 2669 2670 2673 2745 2760 2813 2824 2844 2924 2936
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07) package NAGF01 NagMatrixOperationsPackage NagMatrixOperationsPackage (NAGF01) package NAGE04 NagOptimisationPackage NagOptimisationPackage (NAGE04)	2273 2363 2384 2544 2565 2655 2669 2670 2745 2760 2813 2824 2844 2924 2936 3109
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07) package NAGF01 NagMatrixOperationsPackage NagMatrixOperationsPackage (NAGF01) package NAGE04 NagOptimisationPackage NagOptimisationPackage (NAGE04) package NAGD02 NagOrdinaryDifferentialEquationsPackage	2273 2363 2384 2544 2565 2669 2670 2673 2745 2760 2813 2824 2844 2936 3109 3123
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07) package NAGF01 NagMatrixOperationsPackage NagMatrixOperationsPackage (NAGF01) package NAGE04 NagOptimisationPackage NagOptimisationPackage (NAGE04) package NAGD02 NagOrdinaryDifferentialEquationsPackage NagOrdinaryDifferentialEquationsPackage NagOrdinaryDifferentialEquationsPackage	2273 2363 2384 2544 2565 2669 2670 2673 2745 2760 2813 2824 2844 2936 3109 3123 3207
15	package NAGF02 NagEigenPackage NagEigenPackage (NAGF02) package NAGE02 NagFittingPackage NagFittingPackage (NAGE02) package NAGF04 NagLinearEquationSolvingPackage NagLinearEquationSolvingPackage (NAGF04) package NAGSP NAGLinkSupportPackage NAGLinkSupportPackage (NAGSP) package NAGD01 NagIntegrationPackage NagIntegrationPackage (NAGD01) package NAGE01 NagInterpolationPackage NagInterpolationPackage (NAGE01) package NAGF07 NagLapack NagLapack (NAGF07) package NAGF01 NagMatrixOperationsPackage NagMatrixOperationsPackage (NAGF01) package NAGE04 NagOptimisationPackage NagOptimisationPackage (NAGE04) package NAGD02 NagOrdinaryDifferentialEquationsPackage	2273 2363 2384 2544 2565 2655 2669 2670 2745 2760 2813 2824 2844 2924 2936 3109 3123 3207 3225

package NAGC02 NagPolynomialRootsPackage	64
NagPolynomialRootsPackage (NAGC02)	8(
package NAGC05 NagRootFindingPackage	
NagRootFindingPackage (NAGC05)	0:
package NAGC06 NagSeriesSummationPackage	07
NagSeriesSummationPackage (NAGC06)	6
package NAGS NagSpecialFunctionsPackage	
NagSpecialFunctionsPackage (NAGS)	15
package NSUP2 NewSparseUnivariatePolynomialFunctions2	42
NewSparseUnivariatePolynomialFunctions2 (NSUP2)	4:
package NEWTON NewtonInterpolation	44
NewtonInterpolation (NEWTON)	45
package NPOLYGON NewtonPolygon	47
NewtonPolygon (NPOLYGON)	48
package NCODIV NonCommutativeOperatorDivision	55
NonCommutativeOperatorDivision (NCODIV)	57
package NONE1 NoneFunctions1	6(
NoneFunctions1 (NONE1)	6
package NODE1 NonLinearFirstOrderODESolver	62
NonLinearFirstOrderODESolver (NODE1)	6:
package NLINSOL NonLinearSolvePackage	69
NonLinearSolvePackage (NLINSOL)	7(
package NORMPK NormalizationPackage	74
NormalizationPackage (NORMPK)	7
package NORMMA NormInMonogenicAlgebra	82
NormInMonogenicAlgebra (NORMMA)	8:
package NORMRETR NormRetractPackage	84
NormRetractPackage (NORMRETR)	8
package NPCOEF NPCoef	88
NPCoef (NPCOEF)	89
package NFINTBAS NumberFieldIntegralBasis	9
NumberFieldIntegralBasis (NFINTBAS)	96
package NUMFMT NumberFormats	0:
NumberFormats (NUMFMT)	0;
package NTPOLFN NumberTheoreticPolynomialFunctions	12
NumberTheoreticPolynomialFunctions (NTPOLFN)	13
package NUMERIC Numeric	16
Numeric (NUMERIC)	
package NUMODE NumericalOrdinaryDifferentialEquations	3
NumericalOrdinaryDifferentialEquations (NUMODE)	38
package NUMQUAD NumericalQuadrature	49
NumericalQuadrature (NUMQUAD)	5.
package NCEP NumericComplexEigenPackage	68
NumericComplexEigenPackage (NCEP)	69
package NCNTFRAC Numeric Continued Fraction	7.
NumericContinuedFraction (NCNTFRAC)	72

	package NREP NumericRealEigenPackage	. 3674
	NumericRealEigenPackage (NREP)	. 3675
	package NUMTUBE NumericTubePlot	. 3677
	NumericTubePlot (NUMTUBE)	. 3678
16	Chapter O	3683
	package OCTCT2 OctonionCategoryFunctions2	
	OctonionCategoryFunctions2 (OCTCT2)	
	package ODEINT ODEIntegration	
	ODEIntegration (ODEINT)	
	package ODETOOLS ODETools	
	ODETools (ODETOOLS)	
	package ARRAY12 OneDimensionalArrayFunctions2	
	OneDimensionalArrayFunctions2 (ARRAY12)	
	package ONECOMP2 OnePointCompletionFunctions2	
	OnePointCompletionFunctions2 (ONECOMP2)	
	package OMPKG OpenMathPackage	
	OpenMathPackage (OMPKG)	
	package OMSERVER OpenMathServerPackage	
	OpenMathServerPackage (OMSERVER)	
	package OPQUERY OperationsQuery	
	OperationsQuery (OPQUERY)	
	package ORDCOMP2 OrderedCompletionFunctions2	
	OrderedCompletionFunctions2 (ORDCOMP2)	
	package ORDFUNS OrderingFunctions	
	OrderingFunctions (ORDFUNS)	
	package ORTHPOL OrthogonalPolynomialFunctions	
	OrthogonalPolynomialFunctions (ORTHPOL)	
	OutputPackage (OUT)	. 3123
17	Chapter P	3727
	package PAFF PackageForAlgebraicFunctionField	
	$\label{eq:packageForAlgebraicFunctionField} PackageForAlgebraicFunctionField \ (PAFF) $	
	$package\ PAFFFF\ PackageFor Algebraic Function Field\ Over Finite Field\ .\ .\ .\ .\ .$	
	$\label{packageForAlgebraicFunctionFieldOverFiniteField\ (PAFFFF)\ .\ .\ .\ .\ .\ .\ .}$	
	package PFORP PackageForPoly	
	PackageForPoly (PFORP)	
	package PADEPAC PadeApproximantPackage	
	PadeApproximantPackage (PADEPAC)	
	package PADE PadeApproximants	
	PadeApproximants (PADE)	
	package PWFFINTB PAdicWildFunctionFieldIntegralBasis	
	$PAdicWildFunctionFieldIntegralBasis\ (PWFFINTB)\ .\ .\ .\ .\ .\ .\ .\ .$	
	package YSTREAM Paradoxical Combinators ForStreams	
	ParadoxicalCombinatorsForStreams (YSTREAM)	. 3821

package PLEQN ParametricLinearEquations	23
ParametricLinearEquations (PLEQN)	25
package PARPC2 ParametricPlaneCurveFunctions2	
ParametricPlaneCurveFunctions2 (PARPC2)	46
package PARSC2 ParametricSpaceCurveFunctions2	
ParametricSpaceCurveFunctions2 (PARSC2)	48
package PARSU2 ParametricSurfaceFunctions2	46
ParametricSurfaceFunctions2 (PARSU2)	50
package PARAMP ParametrizationPackage	
ParametrizationPackage (PARAMP)	
package PFRPAC PartialFractionPackage	
PartialFractionPackage (PFRPAC)	
package PARTPERM Partitions And Permutations	
Partitions And Permutations (PARTPERM)	
package PATTERN1 PatternFunctions1	
PatternFunctions1 (PATTERN1)	
package PATTERN2 PatternFunctions2	
PatternFunctions2 (PATTERN2)	
package PATMATCH PatternMatch	
PatternMatch (PATMATCH)	
package PMASS PatternMatchAssertions	
PatternMatchAssertions (PMASS)	
package PMFS PatternMatchFunctionSpace	
PatternMatchFunctionSpace (PMFS)	
package PMINS PatternMatchIntegerNumberSystem	
PatternMatchIntegerNumberSystem (PMINS)	
package INTPM PatternMatchIntegration	
PatternMatchIntegration (INTPM)	
package PMKERNEL PatternMatchKernel	
PatternMatchKernel (PMKERNEL)	
package PMLSAGG PatternMatchListAggregate	
PatternMatchListAggregate (PMLSAGG)	
package PMPLCAT PatternMatchPolynomialCategory	
package PMDOWN PatternMatchPushDown	
PatternMatchPushDown (PMDOWN)	
package PMQFCAT PatternMatchQuotientFieldCategory	
PatternMatchQuotientFieldCategory (PMQFCAT)	
package PATRES2 PatternMatchResultFunctions2	
PatternMatchResultFunctions2 (PATRES2)	
package PMSYM PatternMatchSymbol	
PatternMatchSymbol (PMSYM)	
package PMTOOLS PatternMatchTools	
PatternMatchTools (PMTOOLS)	
package PERMAN Permanent	
Permanent (PERMAN)	33

package PGE PermutationGroupExamples	. 3939
PermutationGroupExamples (PGE)	. 3941
package PICOERCE PiCoercions	. 3953
PiCoercions (PICOERCE)	. 3954
package PLOT1 PlotFunctions1	. 3956
PlotFunctions1 (PLOT1)	. 3957
package PLOTTOOL PlotTools	. 3959
PlotTools (PLOTTOOL)	
package PRJALGPK ProjectiveAlgebraicSetPackage	. 3963
ProjectiveAlgebraicSetPackage (PRJALGPK)	. 3964
package PTFUNC2 PointFunctions2	
PointFunctions2 (PTFUNC2)	
package PTPACK PointPackage	
PointPackage (PTPACK)	
package PFO PointsOfFiniteOrder	
PointsOfFiniteOrder (PFO)	
package PFOQ PointsOfFiniteOrderRational	
PointsOfFiniteOrderRational (PFOQ)	
package PFOTOOLS PointsOfFiniteOrderTools	
PointsOfFiniteOrderTools (PFOTOOLS)	
package PLPKCRV PolynomialPackageForCurve	
PolynomialPackageForCurve (PLPKCRV)	
package POLTOPOL PolToPol	
PolToPol (POLTOPOL)	
package PGROEB PolyGroebner	
PolyGroebner (PGROEB)	
package PAN2EXPR PolynomialAN2Expression	
PolynomialAN2Expression (PAN2EXPR)	
package POLYLIFT PolynomialCategoryLifting	
PolynomialCategoryLifting (POLYLIFT)	
package POLYCATQ PolynomialCategoryQuotientFunctions	
PolynomialCategoryQuotientFunctions (POLYCATQ)	
package PCOMP PolynomialComposition	
PolynomialComposition (PCOMP)	
package PDECOMP PolynomialDecomposition	
PolynomialDecomposition (PDECOMP)	
package PFBR PolynomialFactorizationByRecursion	
PolynomialFactorizationByRecursion (PFBR)	
package PFBRU PolynomialFactorizationByRecursionUnivariate	
PolynomialFactorizationByRecursionUnivariate (PFBRU)	
package POLY2 PolynomialFunctions2	
PolynomialFunctions2 (POLY2)	
package PGCD PolynomialGcdPackage	
PolynomialGcdPackage (PGCD)	
package PINTERP PolynomialInterpolation	
PolynomialInterpolation (PINTERP)	4069

	package PINTERPA PolynomialInterpolationAlgorithms	
	PolynomialInterpolationAlgorithms (PINTERPA)	1071
	package PNTHEORY PolynomialNumberTheoryFunctions	
	PolynomialNumberTheoryFunctions (PNTHEORY)	
	package POLYROOT PolynomialRoots	
	PolynomialRoots (POLYROOT)	1082
	package PSETPK PolynomialSetUtilitiesPackage	
	PolynomialSetUtilitiesPackage (PSETPK)	
	package SOLVEFOR PolynomialSolveByFormulas	
	PolynomialSolveByFormulas (SOLVEFOR)	
	package PSQFR PolynomialSquareFree	
	PolynomialSquareFree (PSQFR)	
	package POLY2UP PolynomialToUnivariatePolynomial	
	PolynomialToUnivariatePolynomial (POLY2UP)	
	package LIMITPS PowerSeriesLimitPackage	
	PowerSeriesLimitPackage (LIMITPS)	
	package PREASSOC PrecomputedAssociatedEquations	
	PrecomputedAssociatedEquations (PREASSOC)	
	package PRIMARR2 PrimitiveArrayFunctions2	
	PrimitiveArrayFunctions2 (PRIMARR2)	
	package PRIMELT PrimitiveElement	
	PrimitiveElement (PRIMELT)	
	package ODEPRIM PrimitiveRatDE	
	PrimitiveRatDE (ODEPRIM)	
	package ODEPRRIC PrimitiveRatRicDE	
	PrimitiveRatRicDE (ODEPRRIC)	
	package PRINT PrintPackage	
	PrintPackage (PRINT)	
	package PSEUDLIN PseudoLinearNormalForm	
	PseudoLinearNormalForm (PSEUDLIN)	
	package PRS PseudoRemainderSequence	
	PseudoRemainderSequence (PRS)	
	package INTPAF PureAlgebraicIntegration	
	PureAlgebraicIntegration (INTPAF)	
	package ODEPAL PureAlgebraicLODE	
	PureAlgebraicLODE (ODEPAL)	
	package PUSHVAR PushVariables	
	PushVariables (PUSHVAR)	
	Tush variables (Tobit vitit)	1201
18	Chapter Q 42	55
	package QALGSET2 QuasiAlgebraicSet2	1255
	QuasiAlgebraicSet2 (QALGSET2)	
	package QCMPACK QuasiComponentPackage	
	QuasiComponentPackage (QCMPACK)	
	package QFCAT2 QuotientFieldCategoryFunctions2	
	QuotientFieldCategoryFunctions2 (QFCAT2)	

package QUATCT2 QuaternionCategoryFunctions2	
QuaternionCategoryFunctions2 (QUATCT2)	. 427
Chapter R	4281
-	. 428
,	
· ,	
· ,	
· /	
Rational Retractions (RATRET)	438
	Chapter R package REP RadicalEigenPackage RadicalEigenPackage (REP) package SOLVERAD RadicalSolvePackage RadicalSolvePackage (SOLVERAD) package RADUTIL RadixUtilities RadixUtilities (RADUTIL) package RDIST RandomDistributions RandomDistributions (RDIST) package RFIDIST RandomIntegerDistributions RandomDistributions (RFDIST) package RIDIST RandomIntegerDistributions RandomIntegerDistributions (RDIST) package RIDIST RandomIntegerDistributions RandomIntegerDistributions (RIDIST) package RANDSRC RandomNumberSource RandomNumberSource (RANDSRC) package RATFACT RationalFactorize RationalFactorize (RATFACT) package RATFACT RationalFactorize RationalFunction (RF) package DEFINTRF RationalFunctionDefiniteIntegration RationalFunctionFactor (RFFACT) package RFFACT RationalFunctionFactor RationalFunctionFactor (RFFACT) package RFFACT RationalFunctionFactorizer RationalFunctionFactor (RFFACT) package RFFACT RationalFunctionFactorizer RationalFunctionFactor (RFFACTOR) package RFFACTOR RationalFunctionFactorizer RationalFunctionIntegration (INTRF) package LIMITRF RationalFunctionIntegration RationalFunctionLimitPackage (LIMITRF) package LIMITRF RationalFunctionSign RationalFunctionSign (SIGNRF) package SUMRF RationalFunctionSign RationalFunctionSign (SIGNRF) package SUMRF RationalFunctionSign RationalFunctionSign (SIGNRF) package SUMRF RationalFunctionSign RationalFunctionSign (RINTERP) package RINTERP RationalIntegration RationalIntegration (INTRAT) package RINTERP RationalInterpolation Introduction Questions and Outlook RationalInterpolation (RINTERP) package ODERAT RationalICODE RationalIODE (ODERAT) package RATRET RationalRenations

package ODERTRIC RationalRicDE	4389
RationalRicDE (ODERTRIC)	4390
package RURPK RationalUnivariateRepresentationPackage	4400
RationalUnivariateRepresentationPackage (RURPK)	
package POLUTIL RealPolynomialUtilitiesPackage	
RealPolynomialUtilitiesPackage (POLUTIL)	
package REALSOLV RealSolvePackage	
RealSolvePackage (REALSOLV)	
package REAL0 RealZeroPackage	
RealZeroPackage (REAL0)	
package REAL0Q RealZeroPackageQ	
RealZeroPackageQ (REAL0Q)	
package RMCAT2 RectangularMatrixCategoryFunctions2	
RectangularMatrixCategoryFunctions2 (RMCAT2)	
package RECOP RecurrenceOperator	
RecurrenceOperator (RECOP)	
Defining new operators	
Recurrences	
Functional Equations	
package RDIV ReducedDivisor	
ReducedDivisor (RDIV)	
package ODERED ReduceLODE	
ReduceLODE (ODERED)	
package REDORDER ReductionOfOrder	
ReductionOfOrder (REDORDER)	
package RSDCMPK RegularSetDecompositionPackage	
RegularSetDecompositionPackage (RSDCMPK)	
The decompose algorithm	
package RSETGCD RegularTriangularSetGcdPackage	
RegularTriangularSetGcdPackage (RSETGCD)	
package REPDB RepeatedDoubling	
RepeatedDoubling (REPDB)	
package REPSQ RepeatedSquaring	
RepeatedSquaring (REPSQ)	
package REP1 RepresentationPackage1	
RepresentationPackage1 (REP1)	
package REP2 RepresentationPackage2	
RepresentationPackage2 (REP2)	
package RESLATC ResolveLatticeCompletion	
ResolveLatticeCompletion (RESLATC)	
package RETSOL RetractSolvePackage	
RetractSolvePackage (RETSOL)	
package RFP RootsFindingPackage	
RootsFindingPackage (RFP)	

20	Chapter S	4	4539
	package SAERFFC SAERationalFunctionAlgFactor		4539
	SAERationalFunctionAlgFactor (SAERFFC)		
	package FORMULA1 ScriptFormulaFormat1		4541
	ScriptFormulaFormat1 (FORMULA1)		4542
	package SEGBIND2 SegmentBindingFunctions2		4543
	SegmentBindingFunctions2 (SEGBIND2)		4544
	package SEG2 SegmentFunctions2		4545
	SegmentFunctions2 (SEG2)		4546
	package SAEFACT SimpleAlgebraicExtensionAlgFactor		4548
	SimpleAlgebraicExtensionAlgFactor (SAEFACT)		4549
	package SIMPAN SimplifyAlgebraicNumberConvertPackage		4550
	SimplifyAlgebraicNumberConvertPackage (SIMPAN)		4552
	package SMITH SmithNormalForm		4553
	SmithNormalForm (SMITH)		4554
	package SCACHE SortedCache		4562
	SortedCache (SCACHE)		4563
	package SORTPAK SortPackage		
	SortPackage (SORTPAK)		
	package SUP2 SparseUnivariatePolynomialFunctions2		4570
	SparseUnivariatePolynomialFunctions2 (SUP2)		4571
	package SPECOUT SpecialOutputPackage		
	SpecialOutputPackage (SPECOUT)		4573
	package SFQCMPK SquareFreeQuasiComponentPackage		
	SquareFreeQuasiComponentPackage (SFQCMPK)		4578
	package SRDCMPK SquareFreeRegularSetDecompositionPackage		
	SquareFreeRegularSetDecompositionPackage (SRDCMPK)		4593
	package SFRGCD SquareFreeRegularTriangularSetGcdPackage		4604
	SquareFreeRegularTriangularSetGcdPackage (SFRGCD)		4605
	package MATSTOR StorageEfficientMatrixOperations		
	StorageEfficientMatrixOperations (MATSTOR)		4623
	package STREAM1 StreamFunctions1		4629
	StreamFunctions1 (STREAM1)		4630
	package STREAM2 StreamFunctions2		4632
	StreamFunctions2 (STREAM2)		4633
	package STREAM3 StreamFunctions3		
	StreamFunctions3 (STREAM3)		4636
	package STINPROD StreamInfiniteProduct		4638
	StreamInfiniteProduct (STINPROD)		4639
	package STTAYLOR StreamTaylorSeriesOperations		4641
	StreamTaylorSeriesOperations (STTAYLOR)		4643
	package STNSR StreamTensor		
	StreamTensor (STNSR)		
	package STTF StreamTranscendentalFunctions		
	StreamTranscendentalFunctions (STTF)		4662
	package STTFNC StreamTranscendentalFunctionsNonCommutative		4678

	$Stream Transcendental Functions Non Commutative \ (STTFNC) \ \dots \ \dots \ \dots$. 4679
	package SCPKG StructuralConstantsPackage	
	StructuralConstantsPackage (SCPKG)	
	package SHP SturmHabichtPackage	
	SturmHabichtPackage (SHP)	
	package SUBRESP SubResultantPackage	
	SubResultantPackage (SUBRESP)	
	package SUPFRACF SupFractionFactorizer	
	SupFractionFactorizer (SUPFRACF)	
	package ODESYS SystemODESolver	
	SystemODESolver (ODESYS)	
	package SYSSOLP SystemSolvePackage	
	SystemSolvePackage (SYSSOLP)	
	package SGCF SymmetricGroupCombinatoricFunctions	
	SymmetricGroupCombinatoricFunctions (SGCF)	
	package SYMFUNC SymmetricFunctions	
	SymmetricFunctions (SYMFUNC)	
	~J (= (=)	,
21	Chapter T	4755
	package TABLBUMP TableauxBumpers	. 4755
	TableauxBumpers (TABLBUMP)	
	package TBCMPPK TabulatedComputationPackage	. 4761
	TabulatedComputationPackage (TBCMPPK)	
	package TANEXP TangentExpansions	. 4767
	TangentExpansions (TANEXP)	. 4768
	package UTSSOL TaylorSolve	. 4770
	TaylorSolve (UTSSOL)	
	package TEMUTL TemplateUtilities	. 4775
	TemplateUtilities (TEMUTL)	
	package TEX1 TexFormat1	
	TexFormat1 (TEX1)	
	package TOOLSIGN ToolsForSign	
	ToolsForSign (TOOLSIGN)	
	package DRAW TopLevelDrawFunctions	. 4784
	TopLevelDrawFunctions (DRAW)	
	package DRAWCURV TopLevelDrawFunctionsForAlgebraicCurves	
	TopLevelDrawFunctionsForAlgebraicCurves (DRAWCURV)	
	package DRAWCFUN TopLevelDrawFunctionsForCompiledFunctions	
	TopLevelDrawFunctionsForCompiledFunctions (DRAWCFUN)	
	package DRAWPT TopLevelDrawFunctionsForPoints	
	TopLevelDrawFunctionsForPoints (DRAWPT)	
	package TOPSP TopLevelThreeSpace	
	TopLevelThreeSpace (TOPSP)	
	package INTHERTR TranscendentalHermiteIntegration	
	TranscendentalHermiteIntegration (INTHERTR)	
	package INTTR TranscendentalIntegration	

	TranscendentalIntegration (INTTR)	. 4834
	package TRMANIP TranscendentalManipulations	
	Transcendental Manipulations (TRMANIP)	. 4852
	The htrigs function	
	package RDETR TranscendentalRischDE	. 4872
	TranscendentalRischDE (RDETR)	. 4873
	package RDETRS TranscendentalRischDESystem	. 4879
	TranscendentalRischDESystem (RDETRS)	. 4880
	package SOLVETRA TransSolvePackage	. 4888
	TransSolvePackage (SOLVETRA)	. 4894
	package SOLVESER TransSolvePackageService	. 4912
	TransSolvePackageService (SOLVESER)	. 4913
	package TRIMAT TriangularMatrixOperations	. 4917
	TriangularMatrixOperations (TRIMAT)	. 4918
	package TRIGMNIP TrigonometricManipulations	. 4920
	TrigonometricManipulations (TRIGMNIP)	. 4922
	package TUBETOOL TubePlotTools	. 4927
	TubePlotTools (TUBETOOL)	. 4928
	package CLIP TwoDimensionalPlotClipping	
	TwoDimensionalPlotClipping (CLIP)	
	package TWOFACT TwoFactorize	. 4944
	TwoFactorize (TWOFACT)	. 4945
22	<u> •</u>	4955
	package UNIFACT UnivariateFactorize	
	UnivariateFactorize (UNIFACT)	
	package UFPS1 UnivariateFormalPowerSeriesFunctions	
	UnivariateFormalPowerSeriesFunctions (UFPS1)	
	package ULS2 UnivariateLaurentSeriesFunctions2	. 4969
	UnivariateLaurentSeriesFunctions2 (ULS2)	. 4970
	package UPOLYC2 UnivariatePolynomialCategoryFunctions2	. 4971
	UnivariatePolynomialCategoryFunctions2 (UPOLYC2)	. 4972
	package UPCDEN UnivariatePolynomialCommonDenominator	
	UnivariatePolynomialCommonDenominator (UPCDEN)	. 4975
	package UPDECOMP UnivariatePolynomialDecompositionPackage	. 4977
	$\label{thm:composition} \mbox{UnivariatePolynomialDecompositionPackage} \ (\mbox{UPDECOMP}) \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	
	package UPDIVP UnivariatePolynomialDivisionPackage	
	$\label{thm:continuous} Univariate Polynomial Division Package \ (UPDIVP) \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $. 4983
	package UP2 UnivariatePolynomialFunctions2	. 4984
	UnivariatePolynomialFunctions2 (UP2)	. 4985
	package UPMP UnivariatePolynomialMultiplicationPackage	. 4987
	UnivariatePolynomialMultiplicationPackage (UPMP)	. 4988
	package UPSQFREE UnivariatePolynomialSquareFree	
	UnivariatePolynomialSquareFree (UPSQFREE)	
	package UPXS2 UnivariatePuiseuxSeriesFunctions2	. 4991
	UnivariatePuiseuxSeriesFunctions2	

CONTENTS	233
CONTENTS	200

	package OREPCTO UnivariateSkewPolynomialCategoryOps	
	UnivariateSkewPolynomialCategoryOps (OREPCTO)	
	package UTS2 UnivariateTaylorSeriesFunctions2	. 5006
	UnivariateTaylorSeriesFunctions2 (UTS2)	
	package UTSODE UnivariateTaylorSeriesODESolver	. 5008
	UnivariateTaylorSeriesODESolver (UTSODE)	. 5009
	package UNISEG2 UniversalSegmentFunctions2	. 5014
	UniversalSegmentFunctions2 (UNISEG2)	. 5015
	package UDPO UserDefinedPartialOrdering	. 5016
	UserDefinedPartialOrdering (UDPO)	. 5017
	package UDVO UserDefinedVariableOrdering	
	UserDefinedVariableOrdering (UDVO)	
	package UTSODETL UTSodetools	
	UTSodetools (UTSODETL)	
	package POLYVEC U32VectorPolynomialOperations	
	U32VectorPolynomialOperations (POLYVEC)	
2	23 Chapter V	5049
	package VECTOR2 VectorFunctions2	. 5049
	VectorFunctions2 (VECTOR2)	. 5050
	package VIEWDEF ViewDefaultsPackage	
	ViewDefaultsPackage (VIEWDEF)	
	package VIEW ViewportPackage	
	ViewportPackage (VIEW)	
2	24 Chapter W	5067
	package WEIER WeierstrassPreparation	. 5067
	WeierstrassPreparation (WEIER)	
	package WFFINTBS WildFunctionFieldIntegralBasis	
	WildFunctionFieldIntegralBasis (WFFINTBS)	
c	25 Chapter X	5083
4		
	package XEXPPKG XExponentialPackage	
2	26 Chapter Y	5087
2	27 Chapter Z	5089
	package ZDSOLVE ZeroDimensionalSolvePackage	. 5089
2	28 Chunk collections	5165
1	Bibliography	5187
I	Index	5203

Volume 10.5: Axiom Algebra: Numerics

1	Nun	nerical Analysis	1
2	The	Quality of Computed Solutions by Sven Hammarling	3
	2.1	Introduction	3
	2.2	Floating Point Numbers and IEEE Arithmetic	4
		2.2.1 Example 2.1 (Floating point numbers)	4
	2.3	Why Worry about Computed Solutions?	6
		2.3.1 Example 3.1 (Cancellation)	6
		2.3.2 Example 3.2 (Sample variance [?], Section 1.9)	7
		2.3.3 Example 3.3 (Hypotenuse)	8
		2.3.4 Example 3.4 (Modulus of a complex number)	9
			10
	2.4		10
			10
		$ubsection. 2.4.1.1\ subsubsection. 2.4.1.2\ subsubsection. 2.4.1.3\ subsubsection. 2.4.1.4$	sul
su	bsecti	on.2.4.1.5 subsubsection.2.4.1.6 subsubsection.2.4.1.7 subsubsection.2.4.1.8	
			16
		$ubsection. 2.4. 2.1\ subsubsection. 2.4. 2.2\ subsubsection. 2.4. 2.3\ subsubsection. 2.4. 2.4$	sul
su	bsecti	on.2.4.2.5	
			21
	subs	$ubsection. 2.4.3.1\ subsubsection. 2.4.3.2\ subsubsection. 2.4.3.3\ subsubsection. 2.4.3.4$	
	2.5		24
		1 (01 /	25
		1 /	26
		1 /	26
		1 /	27
		1 (1 0)	28
	2.6		31
	2.7		31
	2.8	* *	35
		1 /	35
	2.9	Summary	35
3	Cha	pter Overview	37
4	Opt	imizations	39
5	Alge	ebra Cover Code	41
-	5.1		41
			41
			73
			74
	5.2		79
			80

235

			$ lisp \ code \dots \dots$					81
	5.3							_
			fortran code					82
		5.3.2	lisp code	•	 	•		 83
6	\mathbf{BL}_{A}	AS Leve	el 1 Real Vector Operations					85
	6.1	sasum -	the sum of the absolute values		 			 85
		6.1.1	Axiom unit tests		 			 85
		6.1.2	Axiom help page		 			 85
		6.1.3	fortran code		 			 86
		6.1.4	$ lisp\ code\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\$		 			 87
	6.2	saxpy -	constant times a vector plus a vector \dots		 			 88
		6.2.1	Axiom unit tests		 			 88
		6.2.2	Axiom help page		 			 89
		6.2.3	fortran code		 			 89
			$ lisp code \dots \dots$					91
	6.3	scabs1 -	- $abs(real(z))+abs(imag(z))$ of a complex number .		 			 92
			Axiom unit tests					92
			Axiom help page					93
		6.3.3	fortran code		 			 93
			$lisp\ code \dots \dots$					94
	6.4		- $\operatorname{abs}(\operatorname{real}(z)) + \operatorname{abs}(\operatorname{imag}(z))$ of a complex vector $% {\operatorname{real}}(z) = {\operatorname{real}}(z) + {\operatorname{real}}(z)$.					94
			Axiom unit tests					94
			Axiom help page					95
		6.4.3	fortran code		 			 95
			$lisp\ code \dots \dots$					96
	6.5		- Euclidean norm of a vector $\ \ldots \ \ldots \ \ldots$.					97
			Axiom unit tests					97
			Axiom help page					97
			fortran code					98
			$lisp\ code \dots \dots$					99
	6.6		copy a vector \mathbf{x} to a vector \mathbf{y}					
			Axiom unit tests					
			Axiom help page					
			fortran code					
			lisp code					
	6.7		ompute the dot product of two vectors					
			Axiom unit tests					
			Axiom help page		 			
			fortran code					
			lisp code					
	6.8		- compute the inner product of two vectors					
			Axiom unit tests					
			Axiom help page					
			fortran code		 			 109
		6.8.4	lisp code		 			 111

	6.9	snrm2 -	- Euclidean norm of a vector $\sqrt{x'x}$
		6.9.1	Axiom unit tests
		6.9.2	Axiom help page
		6.9.3	fortran code
			lisp code
	6.10		pplies a plane rotation
			Axiom unit tests
			Axiom help page
			fortran code
			lisp code
	6.11		construct givens plane rotation
		_	Axiom unit tests
			Axiom help page
			fortran code
			lisp code
	6.12		apply a modified givens transformation
			Axiom unit tests
			Axiom help page
			fortran code
			lisp code
	6.13		- apply a modified givens transformation
			Axiom unit tests
			Axiom help page
			fortran code
			lisp code
	6.14		scales a vector by a constant
			Axiom unit tests
			Axiom help page
			fortran code
			lisp code
	6.15		interchange two vectors
		_	Axiom unit tests
			Axiom help page
			fortran code
			lisp code
			•
7			el 1 Double Vector Operations 143
	7.1		- sum of the absolute values
			Axiom unit tests
			Axiom help page
		7.1.3	fortran code
			fortran unit test $\dots \dots \dots$
			lisp code
	7.2	- 0	constant time vector plus a vector
			Axiom unit tests
		7.2.2	Axiom help page

CONTENTS	237
JONIENIS	231

	7.2.3 fortran code	162
	7.2.4 fortran unit test	163
	7.2.5 lisp code	
7.3	$dcabs1 - abs(real(z)) + abs(imag(z)) \dots \dots \dots \dots \dots \dots \dots$	
	7.3.1 Axiom unit tests	
	7.3.2 Axiom help page	
	7.3.3 fortran code	
	7.3.4 fortran unit test	
	7.3.5 lisp code	
7.4	dcopy - copy a vector x to a vector y	
	7.4.1 Axiom unit tests	
	7.4.2 Axiom help page	
	7.4.3 fortran code	
	7.4.4 fortran unit test	
	7.4.5 lisp code	
7.5	ddot - dot product of two vectors	
	7.5.1 Axiom unit tests	
	7.5.2 Axiom help page	
	7.5.3 fortran code	
	7.5.4 fortran unit test	
	7.5.5 lisp code	
7.6	dnrm2 - Euclidean norm of a vector	
	7.6.1 Axiom unit tests	
	7.6.2 Axiom help page	
	7.6.3 fortran code	191
	7.6.4 fortran unit test	
	7.6.5 lisp code	
7.7	drot - applies a plane rotation	
	7.7.1 Axiom unit tests	
	7.7.2 Axiom help page	
	7.7.3 fortran code	
	7.7.4 fortran unit test	203
	7.7.5 lisp code	207
7.8	drotg - constructs givens plane rotation	210
	7.8.1 Axiom unit tests	
	7.8.2 Axiom help page	212
	7.8.3 fortran code	216
	7.8.4 fortran unit test	216
	7.8.5 lisp code	220
7.9	drotm - Apply the modified givens transformation to DX^T	222
	7.9.1 Axiom unit tests	222
	7.9.2 Axiom help page	222
	7.9.3 fortran code	224
	7.9.4 lisp code	226
7.10		229
	7.10.1 Axiom unit tests	229

7.10.2 Axiom help page	
7.10.3 fortran code	230
7.10.4 lisp code	233
7.11 dscal - scale a vector by a constant	235
7.11.1 Axiom unit tests	235
7.11.2 Axiom help page	236
7.11.3 fortran code	
7.11.4 fortran unit test	
7.11.5 lisp code	
7.12 dsdot - compute the inner product of two vectors	
7.12.1 Axiom unit tests	
7.12.2 Axiom help page	
7.12.3 fortran code	
7.12.4 lisp code	
7.13 dswap - interchanges two vectors	
7.13.1 Axiom unit tests	
7.13.2 Axiom help page	
7.13.3 fortran code	
7.13.4 fortran unit test	
7.13.5 lisp code	
7.14 dtrsv - solve $Ax = b$ or $A^Tx = b$	
7.14.1 Axiom unit tests	
7.14.2 Axiom help page	
7.14.3 fortran code	
7.14.4 lisp code	
7.15 dzasum - sum of the dcabs1 of a complex vector	
7.15.1 Axiom unit tests	
7.15.2 Axiom help page	
7.15.3 fortran code	
7.15.4 fortran unit test	
7.15.5 lisp code	
7.16 dznrm2 - Euclidean norm of a vector = $\sqrt{x^H * x}$	272
7.16.1 Axiom unit tests	
7.16.2 Axiom help page	
7.16.3 fortran code	
7.16.4 fortran unit test	
7.16.5 lisp code	
7.17 icamax - maximum index function	
7.17.1 Axiom unit tests	
7.17.2 Axiom help page	
7.17.2 Axioni help page	_
7.17.4 fortran unit test	
7.17.5 lisp code	
7.18 idamax - index of element having max. absolute value	
7.18.1 Axiom unit tests	
7.18.2 Axiom help page	289
L TO A ANDULUEU DAYE	403

CONTENTS	239
----------	-----

		7.18.3 fortran code	291
		7.18.4 fortran unit test	
		7.18.5 lisp code	
	7.19	isamax - index of element having max. absolute value	
		7.19.1 Axiom unit tests	
		7.19.2 Axiom help page	297
		7.19.3 fortran code	
		7.19.4 fortran unit test	
		7.19.5 lisp code	
	7.20	izamax	
		7.20.1 Axiom unit tests	303
		7.20.2 Axiom help page	
		7.20.3 fortran code	
		7.20.4 fortran unit test	
		7.20.5 lisp code	309
8		AS Level 1 Complex Vector Operations	311
	8.1	caxpy - constant times a vector plus a vector	
		8.1.1 Axiom unit tests	
		8.1.2 Axiom help page	
		8.1.3 fortran code	
		8.1.4 lisp code	
	8.2	ccopy - copies a vector x to a vector y	
		8.2.1 Axiom unit tests	
		8.2.2 Axiom help page	
		8.2.3 fortran code	
	0.0	8.2.4 lisp code	
	8.3	cdotc - dot product of two complex vectors X^HY	
		8.3.1 Axiom unit tests	
		8.3.2 Axiom help page	
		8.3.3 fortran code	
	0.4	8.3.4 lisp code	
	8.4	cdotu - dot product of two complex vectors X^TY	
		8.4.1 Axiom unit tests	
		8.4.2 Axiom help page	
		8.4.3 fortran code	
	0.5	8.4.4 lisp code	
	8.5	crotg - determines a complex Givens rotation	
		8.5.1 Axiom unit tests	
		8.5.2 Axiom help page	
		8.5.3 fortran code	
	0 6	8.5.4 lisp code	
	8.6	cscal - scales a vector by a constant	
		1 1 0	
		8.6.3 fortran code	320

		8.6.4 lisp code
	8.7	csrot - appies a plane rotation
		8.7.1 Axiom unit tests
		8.7.2 Axiom help page
		8.7.3 fortran code
		8.7.4 lisp code
	8.8	csscal - scales a complex vector by a real constant
		8.8.1 Axiom unit tests
		8.8.2 Axiom help page
		8.8.3 fortran code
		8.8.4 lisp code
	8.9	cswap - interchanges two vectors
		8.9.1 Axiom unit tests
		8.9.2 Axiom help page
		8.9.3 fortran code
		8.9.4 lisp code
9	\mathbf{BL}	AS Level 1 Complex16 Vector Operations 339
	9.1	zaxpy - constant times a vector plus a vector
		9.1.1 Axiom unit tests
		9.1.2 Axiom help page
		9.1.3 fortran code
		9.1.4 fortran unit test
		9.1.5 lisp code
	9.2	zcopy - copies a vector x to a vector y
		9.2.1 Axiom unit tests
		9.2.2 Axiom help page
		9.2.3 fortran code
		9.2.4 lisp code
	9.3	zdotc - dot product of two complex vectors X^HY
		9.3.1 Axiom unit tests
		9.3.2 Axiom help page
		9.3.3 fortran code
		9.3.4 lisp code
	9.4	zdotu - forms the dot product of two complex vectors X^TY
		9.4.1 Axiom unit tests
		9.4.2 Axiom help page
		9.4.3 fortran code
		9.4.4 lisp code
	9.5	zdrot - applies a plane rotation
		9.5.1 Axiom unit tests
		9.5.2 Axiom help page
		9.5.3 fortran code
		9.5.4 lisp code
	9.6	zdscal - scales a vector by a constant
		9.6.1 Axiom unit tests 370

CONTENTS	241
----------	-----

		9.6.2 Axiom help page	70
		9.6.3 fortran code	71
		9.6.4 lisp code	72
	9.7	zrotg - determines a double complex Givens rotation $\dots \dots 3$	73
		9.7.1 Axiom unit tests	73
		9.7.2 Axiom help page	73
		9.7.3 fortran code	75
		9.7.4 lisp code	76
	9.8	zscal - scales a vector by a constant	77
		9.8.1 Axiom unit tests	77
		9.8.2 Axiom help page	77
		9.8.3 fortran code	78
		9.8.4 lisp code	79
	9.9	zswap - interchanges two vectors	80
		9.9.1 Axiom unit tests	80
		9.9.2 Axiom help page	
		9.9.3 fortran code	81
		9.9.4 lisp code	82
10			85
	10.1	sgbmv - $\alpha Ax + \beta y$ or $\alpha A^T x + \beta y$	
		10.1.1 Axiom unit tests	
		10.1.2 Axiom help page	
		10.1.3 fortran code	
		10.1.4 lisp code	
	10.2	sgemv - matrix-vector $\alpha Ax + \beta y$ or $\alpha A^T x + \beta y$	
		10.2.1 Axiom unit tests	
		10.2.2 Axiom help page	
		10.2.3 fortran code	
		10.2.4 lisp code	
	10.3	sger - rank 1 $\alpha x y^T + A$	
		10.3.1 Axiom unit tests	
		10.3.2 Axiom help page	
		10.3.3 fortran code	
		10.3.4 lisp code	
	10.4	ssbmv - $\alpha Ax + \beta y$	
		10.4.1 Axiom unit tests	
		10.4.2 Axiom help page	
		10.4.3 fortran code	
		10.4.4 lisp code	
	10.5	sspmv - matrix-vector $\alpha Ax + \beta y$	
		10.5.1 Axiom unit tests	
		10.5.2 Axiom help page	
		10.5.3 fortran code	
		10.5.4 lisp code	
	10.6	sspr - rank 1 $\alpha xx^T + A$:33

10.6.1 Axiom unit tests	
10.6.2 Axiom help page	
10.6.3 fortran code	
10.6.4 lisp code	
10.7 sspr2 - rank 2 $\alpha xy^T + \alpha yx^T + A$	
10.7.1 Axiom unit tests	
10.7.2 Axiom help page	
10.7.3 fortran code	
10.7.4 lisp code	
10.8 ssymv - matrix-vector $\alpha Ax + \beta y$	
10.8.1 Axiom unit tests	
10.8.2 Axiom help page	
10.8.3 fortran code	
10.8.4 lisp code	
10.9 ssyr - symmetric rank 1 $\alpha x x^T + A$	
10.9.1 Axiom unit tests	
10.9.2 Axiom help page	
10.9.3 fortran code	
10.9.4 lisp code	
$10.10 \operatorname{ssyr} 2 - \alpha x y^T + \alpha y x^T + A \dots \dots$	468
10.10.1 Axiom unit tests	
10.10.2 Axiom help page	
$10.10.3 \mathrm{fortran} \mathrm{code} \ldots \ldots \ldots \ldots \ldots \ldots$	470
$10.10.4 \operatorname{lisp\ code}$	
10.11stbmv - banded matrix-vector $x = A * x$ or $x = A^T x \dots \dots \dots \dots$	476
10.11.1 Axiom unit tests	476
10.11.2 Axiom help page	
$10.11.3 \mathrm{fortran} \mathrm{code} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots $	479
10.11.4 lisp code	
10.12stbsv - banded solve system of equations $Ax = b$ or $A^Tx = b$	
10.12.1 Axiom unit tests	
10.12.2 Axiom help page	491
$10.12.3 \mathrm{fortran} \mathrm{code} \ldots \ldots \ldots \ldots \ldots \ldots$	493
$10.12.4 \operatorname{lisp\ code}$	497
10.13stpmv - matrix-vector $x = A * x$ or $x = A^T x \dots \dots \dots \dots \dots \dots \dots$	504
10.13.1 Axiom unit tests	504
10.13.2 Axiom help page	504
10.13.3 fortran code	506
$10.13.4 \mathrm{lisp} \mathrm{code}$	
10.14stpsv - solve systems of equations $Ax = b$ or $A^Tx = b$. 517
10.14.1 Axiom unit tests	517
10.14.2 Axiom help page	517
$10.14.3\mathrm{fortran}$ code	519
10.14.4 lisp code	
10.15strmv - matrix-vector $x = Ax$ or $x = A^Tx$	
10.15.1 Aviom unit tosts	530

CONTENTS	243
----------	-----

		10.15.0.1.1.1
		10.15.2 Axiom help page
		10.15.3 fortran code
		10.15.4 lisp code
	10.16	strsv - solve systems of equations $Ax = b$ or $A^T x = b$
		10.16.1 Axiom unit tests
		10.16.2 Axiom help page
		10.16.3 fortran code
		10.16.4 lisp code
11		S Level 2 Double Matrix-Vector Operations 555
	11.1	dgbmv - band matrix $\alpha Ax + \beta y$ or $\alpha A^T x + \beta y$
		11.1.1 Axiom unit tests
		11.1.2 Axiom help page
		11.1.3 fortran code
		11.1.4 lisp code
	11.2	dgemv - $\alpha Ax + \beta y$ or $\alpha A^T x + \beta y$
		11.2.1 Axiom unit tests
		11.2.2 Axiom help page
		11.2.3 fortran code
		11.2.4 lisp code
	11.3	dger - rank 1 $\alpha xy^T + a$
		11.3.1 Axiom unit tests
		11.3.2 Axiom help page
		11.3.3 fortran code
		11.3.4 lisp code
	11 4	dsbmv - banded $\alpha Ax + \beta y$
	11.4	11.4.1 Axiom unit tests
		11.4.2 Axiom help page
		11.4.2 Axioni help page
		11.4.4 lisp code
	11 5	
	11.0	dspmv - matrix-vector operation $\alpha Ax + \beta y$
		11.5.1 Axiom unit tests
		11.5.2 Axiom help page
		11.5.3 fortran code
	11.0	11.5.4 lisp code
	11.6	dspr - symmetric rank 1 $\alpha xx^T + A$
		11.6.1 Axiom unit tests
		11.6.2 Axiom help page
		11.6.3 fortran code
		11.6.4 lisp code
	11.7	dspr2 - symmetric rank 2 $\alpha xy^T + \alpha yx^T + A$
		11.7.1 Axiom unit tests
		11.7.2 Axiom help page
		11.7.3 fortran code
		11.7.4 lisp code
	11.8	dsymv - matrix-vector operation $\alpha Ax + \beta y$

11.8.1 Axiom unit tests
11.8.2 Axiom help page
11.8.3 fortran code
11.8.4 lisp code
11.9 dsyr - rank 1 $\alpha x x^T + A$
11.9.1 Axiom unit tests
11.9.2 Axiom help page
11.9.3 fortran code
11.9.4 lisp code
11.10dsyr2 - symmetric rank 2 $\alpha xy^T + \alpha yx^T + A$
11.10.1 Axiom unit tests
11.10.2 Axiom help page
11.10.3 fortran code
11.10.4 lisp code
11.11dtbmv - triangular banded matrix $x = Ax$ or $x = A^Tx$ 65
11.11.1 Axiom unit tests
11.11.2 Axiom help page
11.11.3 fortran code
11.11.4 lisp code
11.12dtbsv - triangular banded matrix $Ax = b$ or $A^T x = b \dots \dots$
11.12.1 Axiom unit tests
11.12.2 Axiom help page
11.12.3 fortran code
11.12.4 lisp code
11.13dtpmv - matrix-vector $x = Ax$ or $x = A^Tx \dots \dots$
11.13.1 Axiom unit tests
11.13.2 Axiom help page
11.13.3 fortran code
11.13.4 lisp code
11.14dtpsv - solve systems of equations $Ax = b$ or $A^T x = b$
11.14.1 Axiom unit tests
11.14.2 Axiom help page
11.14.3 fortran code
11.14.4 lisp code
11.15dtrmv - matrix-vector $x = Ax$ or $x = A^Tx$
11.15.1 Axiom unit tests
11.15.2 Axiom help page
11.15.3 fortran code
11.15.4 lisp code
11.16dtrsv - solve system of equations $Ax = b$ or $A' = b$
11.16.1 Axiom unit tests
11.16.2 Axiom help page
11.16.3 fortran code
11.16.4 lisp code

12	BLA	AS Level 2 Complex Matrix-Vector Operations	743
	12.1	cgbmv - band mat-vec $\alpha Ax + \beta y$ or $\alpha A^T + \beta y$ or $\alpha A^H x + \beta y$. 743
		12.1.1 Axiom unit tests	. 743
		12.1.2 Axiom help page	. 743
		12.1.3 fortran code	. 746
		12.1.4 lisp code	. 750
	12.2	cgemv - matrix-vector $\alpha Ax + \beta y$ or $\alpha A^T + \beta y$ or $\alpha A^H x + \beta y$. 756
		12.2.1 Axiom unit tests	
		12.2.2 Axiom help page	. 756
		12.2.3 fortran code	. 758
		12.2.4 lisp code	
	12.3	cgerc - rank 1 $\alpha xy^H + A$	
		12.3.1 Axiom unit tests	
		12.3.2 Axiom help page	
		12.3.3 fortran code	
		12.3.4 lisp code	
	12.4	cgeru - rank 1 $\alpha x y^T + A$	
		12.4.1 Axiom unit tests	
		12.4.2 Axiom help page	
		12.4.3 fortran code	
		12.4.4 lisp code	
	12.5	chbmy - hermitian band matrix-vector $\alpha Ax + \beta y$	
		12.5.1 Axiom unit tests	
		12.5.2 Axiom help page	
		12.5.3 fortran code	
		12.5.4 lisp code	
	12.6	chemy - hermitian matrix-vector $\alpha Ax + \beta y$	
		12.6.1 Axiom unit tests	
		12.6.2 Axiom help page	
		12.6.3 fortran code	
		12.6.4 lisp code	
	12.7	cher - hermitian rank 1 $\alpha x x^H + A$	
		12.7.1 Axiom unit tests	
		12.7.2 Axiom help page	
		12.7.3 fortran code	
		12.7.4 lisp code	
	12.8	cher2 - hermitian rank 2 $\alpha xy^H + conjg(\alpha)yx^H + A$	
		12.8.1 Axiom unit tests	. 811
		12.8.2 Axiom help page	
		12.8.3 fortran code	
		12.8.4 lisp code	
	12.9	chpmv - hermitian matrix-vector $\alpha Ax + \beta y$	
		12.9.1 Axiom unit tests	
		12.9.2 Axiom help page	
		12.9.3 fortran code	
		12.9.4 lisp code	

	12.10chpr - hermitian $\alpha x x^H + A$		834
	12.10.1 Axiom unit tests		834
	12.10.2 Axiom help page		834
	12.10.3 fortran code		836
	12.10.4 lisp code		839
	12.11chpr2 - hermitian rank 2 $\alpha xy^H + conjg(\alpha)yx^H + A$		844
	12.11.1 Axiom unit tests		844
	12.11.2 Axiom help page		845
	12.11.3 fortran code		846
	12.11.4 lisp code		
	12.12ctbmv - banded matrix-vector Ax or A^Tx or A^Hx		856
	12.12.1 Axiom unit tests		856
	12.12.2 Axiom help page		857
	12.12.3 fortran code		859
	12.12.4 lisp code		
	12.13ctbsv - banded solved systems of equations $Ax = b$ or $A^Tx = b$ or $A^Hx = b$		874
	12.13.1 Axiom unit tests		874
	12.13.2 Axiom help page		875
	12.13.3 fortran code		877
	12.13.4 lisp code		882
	12.14ctpmv - packed matrix-vector Ax or A^Tx or A^Hx		892
	12.14.1 Axiom unit tests		892
	12.14.2 Axiom help page		893
	12.14.3 fortran code		895
	12.14.4 lisp code		
	12.15ctpsv - solve system of equations $Ax = b$ or $A^Tx = b$ or $A^Hx = b$		909
	12.15.1 Axiom unit tests		909
	12.15.2 Axiom help page		909
	12.15.3 fortran code		911
	12.15.4 lisp code		916
	12.16ctrmv - matrix-vector Ax or A^Tx or A^Hx		
	12.16.1 Axiom unit tests		
	12.16.2 Axiom help page		
	12.16.3 fortran code		
	12.16.4 lisp code		
	12.17ctrsv - solve systems of equations $Ax = b$ or $A^Tx = b$ or $A^Hx = b$		
	12.17.1 Axiom unit tests		
	12.17.2 Axiom help page		
	12.17.3 fortran code		
	12.17.4 lisp code		948
10	DIACI 12 C 1c M-t W-t Oti		959
13	BLAS Level 2 Complex16 Matrix-Vector Operations 13.1 zgbmv - banded $\alpha Ax + \beta y$ or $\alpha A^T x + \beta y$ or $\alpha A^H x + \beta y$		9 59 9 5 9
	13.1.1 Axiom unit tests		959
	13.1.2 Axiom help page		
	13.1.2 Axiom neip page	•	962

13.1.4 lisp code	 	 	966
13.2 zgemv - matrix-vector $\alpha Ax + \beta y$ or $\alpha A^T x + \beta y$ or $\alpha A^H x + \beta y$	 	 	972
13.2.1 Axiom unit tests			
13.2.2 Axiom help page			
13.2.3 fortran code			
13.2.4 lisp code			
13.3 zgerc - rank 1 $\alpha xy^H + A$			
13.3.1 Axiom unit tests			
13.3.2 Axiom help page			
13.3.3 fortran code			
13.3.4 lisp code			
13.4 zgeru - rank 1 $\alpha xy^T + A$			
13.4.1 Axiom unit tests			
13.4.2 Axiom help page			
13.4.3 fortran code			
13.4.4 lisp code			
•			
13.5 zhbmv - hermitian band matrix-vector $\alpha Ax + \beta y$			
13.5.1 Axiom unit tests			
13.5.2 Axiom help page			
13.5.3 fortran code			
13.5.4 lisp code			
13.6 zhemv - hermitian matrix-vector $\alpha Ax + \beta y$			
13.6.1 Axiom unit tests			
13.6.2 Axiom help page			
13.6.3 fortran code			
13.6.4 lisp code			
13.7 zher - hermitian rank 1 $\alpha x x^H + A$			
13.7.1 Axiom unit tests			
13.7.2 Axiom help page			
13.7.3 fortran code			
13.7.4 lisp code			
13.8 zher2 - hermitian rank 2 $\alpha xy^H + conjg(\alpha)yx^H + A$	 	 	1030
13.8.1 Axiom unit tests			
13.8.2 Axiom help page			
13.8.3 fortran code			
13.8.4 lisp code			
13.9 zhpmv - hermitian matrix-vector $\alpha Ax + \beta y$			
13.9.1 Axiom unit tests			1044
13.9.2 Axiom help page			
13.9.3 fortran code	 	 	1046
13.9.4 lisp code			
13.10zhpr - hermitian rank 1 $\alpha xx^H + A$	 	 	1056
13.10.1 Axiom unit tests	 	 	1056
13.10.2 Axiom help page	 	 	1056
13.10.3 fortran code	 	 	1058
13.10.4 lisp code	 	 	1061

13.11zhpr2 - hermitian rank $2 \alpha xy^H + conjg(\alpha)yx^H + A \dots \dots$		
13.11.1 Axiom unit tests		. 1067
13.11.2 Axiom help page		. 1067
13.11.3 fortran code		. 1069
13.11.4 lisp code		. 1073
13.12ztbmv - band matrix-vector Ax or A^Tx or A^Hx		
13.12.1 Axiom unit tests		
13.12.2 Axiom help page		. 1081
13.12.3 fortran code		. 1084
13.12.4 lisp code		
13.13ztbsv - solve equations $Ax = b$ or $A^T x = b$ or $A^H x = b$. 1100
13.13.1 Axiom unit tests		
13.13.2 Axiom help page		. 1100
13.13.3 fortran code		. 1103
13.13.4 lisp code		
13.14ztpmv - matrix-vector Ax or A^Tx or A^Hx		
13.14.1 Axiom unit tests		
13.14.2 Axiom help page		
13.14.3 fortran code		
13.14.4 lisp code		
13.15ztpsv - solves systems of equations $Ax = b$ or $A^Tx = b$ or $A^Hx = b$		
13.15.1 Axiom unit tests		. 1137
13.15.2 Axiom help page		. 1137
13.15.3 fortran code		. 1139
13.15.4 lisp code		. 1144
13.16ztrmv - triangular matrix-vector Ax or A^Tx or A^Hx		
13.16.1 Axiom unit tests		. 1155
13.16.2 Axiom help page		. 1155
13.16.3 fortran code		. 1157
13.16.4 lisp code		. 1162
13.17ztrsv - triangular solve system of equations $Ax = b$ or $A^Tx = b$ or $A^Hx = b$	<i>- b</i>	. 1171
13.17.1 Axiom unit tests		. 1171
13.17.2 Axiom help page		. 1171
13.17.3 fortran code		. 1173
13.17.4 lisp code		. 1178
14 BLAS Level 3 Real Matrix-Matrix Operations		1189
14.1 sgemm - $\alpha op(A)op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$		
14.1.1 Axiom unit tests		
14.1.2 Axiom help page		
14.1.3 fortran code		
14.1.4 lisp code		
14.2 ssymm - matrix-matrix $\alpha AB + \beta C$ or $\alpha BA + \beta C$		
14.2.1 Axiom unit tests		
14.2.2 Axiom help page	• •	
14 2 3 fortran code		1203

		14.2.4 lisp code	1207
	14.3	ssyr2k - rank2k $\alpha AB^T + \alpha BA^T + \beta C$ or $\alpha A^TB + \alpha B^TA + \beta C$	1212
		14.3.1 Axiom unit tests	
		14.3.2 Axiom help page	
		14.3.3 fortran code	
		14.3.4 lisp code	
	14.4	ssyrk - symmetric rank k $\alpha AA^T + \beta C$ or $\alpha A^T A + \beta C$	
		14.4.1 Axiom unit tests	
		14.4.2 Axiom help page	
		14.4.3 fortran code	1228
		14.4.4 lisp code	1232
	14.5	strmm - $\alpha op(A)B$ or $\alpha Bop(A)$, $op(A) = A$ or $op(A) = A^T$	1237
		14.5.1 Axiom unit tests	1237
		14.5.2 Axiom help page	1237
		14.5.3 fortran code	1240
		14.5.4 lisp code	
	14.6	strsm - $op(A)X = \alpha B$ or $Xop(A) = \alpha B$, $op(A) = A$ or $op(A) = A^T$	
		14.6.1 Axiom unit tests	
		14.6.2 Axiom help page	
		14.6.3 fortran code	
		14.6.4 lisp code	1260
1 5	DI A	AS Level 3 Double Matrix-Matrix Operations	1271
10		dgemm - $\alpha op(A)op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$	
	10.1	15.1.1 Axiom unit tests	
		15.1.2 Axiom help page	
		15.1.3 fortran code	
		15.1.4 lisp code	
	15.2		
	-	dsymm - $\alpha AB + \beta C$ or $\alpha BA + \beta C$	
		dsymm - $\alpha AB + \beta C$ or $\alpha BA + \beta C$	1283
		15.2.1 Axiom unit tests	1283 1283
		15.2.1 Axiom unit tests	1283 1283 1284
		15.2.1 Axiom unit tests	1283 1283 1284 1286
	15.3	15.2.1 Axiom unit tests 15.2.2 Axiom help page 15.2.3 fortran code	1283 1283 1284 1286 1290
	15.3	15.2.1 Axiom unit tests 15.2.2 Axiom help page 15.2.3 fortran code 15.2.4 lisp code	1283 1283 1284 1286 1290 1297
	15.3	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1283 1283 1284 1286 1290 1297 1297
	15.3	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1283 1284 1286 1290 1297 1297 1300
		15.2.1 Axiom unit tests	1283 1284 1286 1290 1297 1297 1300 1304
		$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1283 1284 1286 1290 1297 1297 1300 1304 1311
		15.2.1 Axiom unit tests	1283 1284 1286 1290 1297 1297 1300 1304 1311
		15.2.1 Axiom unit tests $15.2.2 \text{ Axiom help page} \\ 15.2.3 \text{ fortran code} \\ 15.2.4 \text{ lisp code} \\ \frac{1}{3} \\ $	1283 1284 1286 1297 1297 1297 1300 1304 1311 1311
		15.2.1 Axiom unit tests	1283 1284 1286 1290 1297 1297 1300 1304 1311 1311
	15.4	15.2.1 Axiom unit tests	1283 1284 1286 1290 1297 1297 1300 1304 1311 1311 1313
	15.4	15.2.1 Axiom unit tests	. 1283 . 1284 . 1286 . 1290 . 1297 . 1297 . 1300 . 1304 . 1311 . 1311 . 1313 . 1317
	15.4	15.2.1 Axiom unit tests	. 1283 . 1284 . 1284 . 1286 . 1290 . 1297 . 1297 . 1300 . 1304 . 1311 . 1311 . 1313 . 1313 . 1323

16.1 cgemm - $\alpha op(A) op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$ or $op(X) = X^H$. 135 . 16.1.1 Axiom unit tests . 135 . 16.1.2 Axiom help page . 135 . 16.1.3 fortran code . 136 . 16.1.4 lisp code . 136 . 16.1.4 lisp code . 137 . 16.2.1 Axiom unit tests . 137 . 16.2.2 Axiom help page . 137 . 16.2.2 Axiom help page . 137 . 16.2.3 fortran code . 138 . 16.3 cher2k - hermitian rank $2 \alpha AB^H + conjg(\alpha)BA^H + \beta C$ or $\alpha A^H B + conjg(\alpha)B^H A + \beta C$. 138 . 16.3.1 Axiom unit tests . 138 . 16.3.2 Axiom help page . 139 . 16.3.3 fortran code . 139 . 16.3.4 lisp code . 130 . 16.3.4 lisp code . 140 . 16.4.1 Axiom unit tests . 140 . 16.4.2 Axiom help page . 140 . 16.4.3 fortran code . 141 . 16.5 csymm - symmetric $\alpha AB + \beta C$ or $\alpha BA + \beta C$. 144 . 16.5.2 Axiom help page . 142 . 16.5.3 fortran code . 142 . 16.5.4 lisp code . 142 . 16.5.5 Axiom help page . 142 . 16.5.6 lisp code . 142 . 16.6.1 Axiom unit tests . 142 . 16.6.2 Axiom help page . 143 . 16.6.3 Axiom help page . 144 . 16.6.4 lisp code . 144 . 16.6.4 lisp code . 144 . 16.6.4 lisp code . 145 . 16.6.3 Axiom help page . 145 . 16.6.4 lisp code . 146 . 16.6.4 lisp code . 147 . 16.6.6 Axiom help page . 147 . 16.6.6 lisp code . 147 . 16.6.6 lisp code . 148 . 16.6.1 Axiom unit tests . 149 . 16.6.1 Axiom unit tests . 140 . 16.6.1 Axiom unit tests . 140 . 16.6.4 lisp code . 141 . 16.5 resymmetric $\alpha AB^T + \alpha BA^T + \beta C$ or $\alpha A^T B + \alpha B^T A + \beta C$. 144 . 16.6.4 lisp code . 145 . 16.6.4 lisp code . 146 . 16.6.4 lisp code . 147 . 16.6.7 axiom help page . 147 . 16.6.7 axiom help page . 148 . 16.6.7 axiom unit tests . 148 . 16.6.7 axiom help page . 148 . 16.6.7 axiom help page . 148 . 16.6.7 axiom help page . 149 . 16.6.7 axiom help page . 140 . 16.6.7 axiom help page . 141 . 16.6.7 axiom help page . 144 . 16.6.7 axiom help page . 144 . 16.6.7 axiom help page		15.5.3 fortran code	. 1326
15.6.1 Axiom unit tests 15.6.2 Axiom help page 134 15.6.3 fortran code 15.6.4 lisp code 15.6.4 lisp code 15.6.5 lost lost lost lost lost lost lost lost		15.5.4 lisp code	. 1330
15.6.1 Axiom unit tests 15.6.2 Axiom help page 134 15.6.3 fortran code 15.6.4 lisp code 15.6.4 lisp code 15.6.5 lost lost lost lost lost lost lost lost	15.6	dtrsm - $op(A)X = \alpha B$ or $Xop(A) = \alpha B$, $op(A) = A$ or $op(A) = A^T$. 1340
15.6.3 fortran code 134 15.6.4 lisp code 134 16 BLAS Level 3 Complex Matrix-Matrix Operations 135 16.1 cgemm $- aop(A)op(B) + βC, op(X) = X \text{ or } op(X) = X^T \text{ or } op(X) = X^H$ 135 16.1.1 Axiom unit tests 135 16.1.2 Axiom help page 135 16.1.3 fortran code 136 16.1.4 lisp code 136 16.2 chemm - hermitian $\alpha AB + \beta C$ or $\alpha BA + \beta C$ 137 16.2.1 Axiom unit tests 137 16.2.2 Axiom help page 137 16.2.3 fortran code 138 16.2.4 lisp code 138 16.3 cher2k - hermitian rank 2 $\alpha AB^H + conjg(\alpha)BA^H + \beta C$ or $\alpha A^H B + conjg(\alpha)B^H A + \beta C$ 138 16.3.1 Axiom unit tests 138 16.3.2 Axiom help page 138 16.3.3 fortran code 139 16.4 cherk - hermitian rank k $\alpha AA^H + \beta C$ or $\alpha A^H A + \beta C$ 140 16.4.1 Axiom unit tests 140 16.4.2 Axiom help page 144 16.4.3 fortran code 140 16.4.4 kisp code 141 16.5.1 Axiom unit tests 142 16.5.2 Axiom help page 142		15.6.1 Axiom unit tests	. 1340
15.6.4 lisp code		15.6.2 Axiom help page	. 1340
16 BLAS Level 3 Complex Matrix-Matrix Operations 16.1 cgemm - $\alpha op(A)op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$ or $op(X) = X^H$ 135 16.1.1 Axiom unit tests 16.1.2 Axiom help page 136 16.1.3 fortran code 16.1.4 lisp code 16.2 chemm - hermitian $\alpha AB + \beta C$ or $\alpha BA + \beta C$ 137 16.2.1 Axiom unit tests 137 16.2.2 Axiom help page 137 16.2.3 fortran code 138 16.3 cher2k - hermitian rank 2 $\alpha AB^H + conjg(\alpha)BA^H + \beta C$ or $\alpha A^HB + conjg(\alpha)B^HA + \beta C$ 138 16.3.1 Axiom unit tests 16.3.2 Axiom help page 16.3.3 fortran code 16.3.3 fortran code 16.3.4 lisp code 139 16.3.4 lisp code 130 16.4 cherk - hermitian rank k $\alpha AA^H + \beta C$ or $\alpha A^HA + \beta C$ 140 16.4.1 Axiom unit tests 141 16.4.2 Axiom help page 142 16.5.3 fortran code 16.4.4 lisp code 141 16.5.4 lisp code 142 16.5.1 Axiom unit tests 142 16.5.2 Axiom help page 143 16.5.3 fortran code 16.6.4 lisp code 144 16.5.4 lisp code 145 16.5.5 Axiom help page 146 16.6.5 csymm - symmetric αAB + βC or αBA + βC 142 16.5.1 Axiom unit tests 142 16.5.2 Axiom help page 143 16.6.3 fortran code 16.6.4 lisp code 146 16.6.4 lisp code 147 16.7.1 Axiom unit tests 149 16.7.2 Axiom help page 140 16.7.3 fortran code 141 16.7.3 fortran code 142 16.7.4 lisp code 144 16.7.3 fortran code 145 16.7.4 lisp code		15.6.3 fortran code	. 1343
16.1 cgemm - $\alpha op(A) op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$ or $op(X) = X^H$. 135 16.1.1 Axiom unit tests		15.6.4 lisp code	. 1348
16.1 cgemm - $\alpha op(A) op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$ or $op(X) = X^H$. 135 16.1.1 Axiom unit tests	16 BL	AS Level 3 Complex Matrix-Matrix Operations	1359
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	16.1	egemm - $\alpha op(A)op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$ or $op(X) = X^H$.	. 1359
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		16.1.1 Axiom unit tests	. 1359
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		16.1.2 Axiom help page	. 1359
16.2 chemm - hermitian $\alpha AB + \beta C$ or $\alpha BA + \beta C$. 137 16.2.1 Axiom unit tests . 137 16.2.2 Axiom help page . 137 16.2.3 fortran code . 138 16.2.4 lisp code 138 16.2.4 lisp code		16.1.3 fortran code	. 1362
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		16.1.4 lisp code	. 1367
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	16.2	chemm - hermitian $\alpha AB + \beta C$ or $\alpha BA + \beta C$. 1377
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		16.2.1 Axiom unit tests	. 1377
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		16.2.2 Axiom help page	. 1377
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			
βC 138 16.3.1 Axiom unit tests 138 16.3.2 Axiom help page 139 16.3.3 fortran code 139 16.4.4 lisp code 140 16.4.5 cherk - hermitian rank k $\alpha AA^H + \beta C$ or $\alpha A^H A + \beta C$ 140 16.4.4 nain and tests 140 16.4.2 Axiom help page 140 16.4.3 fortran code 140 16.4.4 lisp code 141 16.5 csymm - symmetric $\alpha AB + \beta C$ or $\alpha BA + \beta C$ 142 16.5 1.4 16.5 2.4 16.5 2.4 Axiom unit tests 142 16.5 2.5 Axiom help page 142 16.5 2.5 Axiom unit tests 143 16.6 1.5 143 16.6 145 16.6 3.6 3.6 144 16.7 3.6 144 16.7 2.5 Axiom help page 143 16.6 145 165 145 16.7 3.6 4.7 4.7 4.6 145			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	16.3		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	16.4	· · · · · · · · · · · · · · · · · · ·	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			
16.5.1 Axiom unit tests 142 16.5.2 Axiom help page 142 16.5.3 fortran code 142 16.5.4 lisp code 142 16.6 csyr2k - symmetric rank $2k \alpha AB^T + \alpha BA^T + \beta C$ or $\alpha A^TB + \alpha B^TA + \beta C$ 143 16.6.1 Axiom unit tests 143 16.6.2 Axiom help page 143 16.6.3 fortran code 144 16.7 csyrk - symmetric $\alpha AA^T + \beta C$ or $\alpha A^TA + \beta C$ 144 16.7.1 Axiom unit tests 144 16.7.2 Axiom help page 144 16.7.3 fortran code 145 16.7.4 lisp code 145	105	•	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	16.5		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$			
$16.6.1$ Axiom unit tests 143 $16.6.2$ Axiom help page 143 $16.6.3$ fortran code 143 $16.6.4$ lisp code 144 16.7 csyrk - symmetric $\alpha AA^T + \beta C$ or $\alpha A^TA + \beta C$ 144 $16.7.1$ Axiom unit tests 144 $16.7.2$ Axiom help page 144 $16.7.3$ fortran code 145 $16.7.4$ lisp code 145	166		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	10.0		
16.6.3 fortran code 143 16.6.4 lisp code 144 16.7 csyrk - symmetric $\alpha AA^T + \beta C$ or $\alpha A^TA + \beta C$ 144 16.7.1 Axiom unit tests 144 16.7.2 Axiom help page 144 16.7.3 fortran code 145 16.7.4 lisp code 145			
16.6.4 lisp code <		110	
16.7 csyrk - symmetric $\alpha AA^T + \beta C$ or $\alpha A^TA + \beta C$ 144 16.7.1 Axiom unit tests 144 16.7.2 Axiom help page 144 16.7.3 fortran code 145 16.7.4 lisp code 145			
16.7.1 Axiom unit tests	16.7		
16.7.2 Axiom help page .	10.7		
16.7.3 fortran code			
16.7.4 lisp code			
<u> </u>			
	16.8	1	

		16.8.1 Axiom unit tests	146
		16.8.2 Axiom help page	146
		16.8.3 fortran code	146^{2}
		16.8.4 lisp code	1469
	16.9	ctrsm - triangular $op(A)X = \alpha B$ or $Xop(A) = \alpha B$, $op(A) = A$ or $op(A) = A^T$	
		or $op(A) = A^H$	1480
		16.9.1 Axiom unit tests	1480
		16.9.2 Axiom help page	1483
		16.9.3 fortran code	1483
		16.9.4 lisp code	1489
17	BLA	AS Level 3 Complex16 Matrix-Matrix Operations	1503
		zgemm - $\alpha op(A)op(B) + \beta C$, $op(X) = X$ or $op(X) = X^T$ or $op(X) = X^H$	1503
		17.1.1 Axiom unit tests	1503
		17.1.2 Axiom help page	
		17.1.3 fortran code	
		17.1.4 lisp code	
	17.2	zhemm - hermitian $\alpha AB + \beta C$ or $\alpha BA + \beta C$	
		17.2.1 Axiom unit tests	
		17.2.2 Axiom help page	
		17.2.3 fortran code	
		17.2.4 lisp code	
	17.3	zher2k - hermitian rank 2k $\alpha AB^H + conjg(\alpha)BA^H + \beta C$ or $\alpha A^HB + conjg(\alpha)B^H$	A+
		$eta C \ldots \ldots $	
		17.3.1 Axiom unit tests	
		17.3.2 Axiom help page	
		17.3.3 fortran code	
		17.3.4 lisp code	
	17.4	zherk - hermitian rank k $\alpha AA^H + \beta C$ or $\alpha A^H A + \beta C$	
		17.4.1 Axiom unit tests	
		17.4.2 Axiom help page	
		17.4.3 fortran code	
		17.4.4 lisp code	
	17.5	zsymm - symmetric $\alpha AB + \beta C$ or $\alpha BA + \beta C$	
		17.5.1 Axiom unit tests	
		17.5.2 Axiom help page	
		17.5.3 fortran code	
		17.5.4 lisp code	157
	17.6	zsyr2k - symmetric rank 2k $\alpha AB^T + \alpha BA^T + \beta C$ or $\alpha A^TB + \alpha B^TA + \beta C$.	1584
		17.6.1 Axiom unit tests	
		17.6.2 Axiom help page	1584
		17.6.3 fortran code	
		17.6.4 lisp code	1591
	17.7	zsyrk - symmetric rank k $\alpha AA^T + \beta C$ or $\alpha A^T A + \beta C$	1598
		17.7.1 Axiom unit tests	
		17.7.2 Axiom help page	1598

		17.7.3 fortran code	1600
		17.7.4 lisp code	1604
	17.8	ztrmm - triangular $\alpha op(A)B$ or $\alpha Bop(A)$, $op(A) = A$ or $op(A) = A^T$ or	
		$op(A) = A^H \dots \dots$	1610
		17.8.1 Axiom unit tests	1610
		17.8.2 Axiom help page	1610
		17.8.3 fortran code	1613
		17.8.4 lisp code	1618
	17.9	ztrsm - triangular $op(A)X = \alpha B \ Xop(A) = \alpha B, \ op(A) = A \ or \ op(A) = A^T$	
		or $op(A) = A^H$	
		17.9.1 Axiom unit tests	1629
		17.9.2 Axiom help page	
		17.9.3 fortran code	
		17.9.4 lisp code	
		1	
18	LAF	PACK Concepts	1651
	18.1	Tridiagonal matrices [?]	1651
	18.2	Condition Number [?]	1651
	18.3	Euclidean Norm [?]	1652
		• •	
19			1653
		General Matrix	
		General Band Matrix	
		General Tridiagonal Matrix	
		Symmetric/Hermitian Positive Definite	
	19.5	Symmetric/Hermitian Positive Definite (packed storage)	1656
	19.6	Symmetric/Hermitian Positive Definite Band	1656
	19.7	Symmetric/Hermitian Positive Definite Tridiagonal	1656
	19.8	Symmetric/Hermitian Indefinite Matrix	1657
	19.9	Complex Symmetric Matrix	1657
	19.10	OSymmetric/Hermitian Indefinite Matrix (packed storage)	1657
	19.1	1 Complex Symmetric (packed storage) Matrix	1657
	19.12	2Triangular Matrix	1658
	19.13	3Triangular Matrix (packed storage)	1658
	19.14	4Triangular Band Matrix	1658
20			1659
	20.1	dgels	
		20.1.1 Axiom unit tests	
		20.1.2 Axiom help page	
		20.1.3 fortran code	
		20.1.4 lisp code	
	20.2	dgelsd	
		20.2.1 Axiom unit tests	
		20.2.2 Axiom help page	1678
		20.2.3 fortran code	1681

CONTENTS	253
CONTENTS	253

		20.2.4 lisp code
	20.3	dgelss
		20.3.1 Axiom unit tests
		20.3.2 Axiom help page
		20.3.3 fortran code
		20.3.4 lisp code
	20.4	dgelsx - DEPRECATED. Use dgelsy
	20.5	dgelsy
		20.5.1 Axiom unit tests
		20.5.2 Axiom help page
		20.5.3 fortran code
		$20.5.4 \text{ lisp code} \dots \dots$
	20.6	dgesv
		20.6.1 Axiom unit tests
		20.6.2 Axiom help page
		20.6.3 fortran code
		20.6.4 lisp code
	20.7	dgesvx
		20.7.1 Axiom unit tests
		20.7.2 Axiom help page
		20.7.3 fortran code
		20.7.4 lisp code
	20.8	dgesvxx
		20.8.1 Axiom unit tests
		20.8.2 Axiom help page
		20.8.3 fortran code
		20.8.4 lisp code
	20.9	dsgesv
		20.9.1 Axiom unit tests
		20.9.2 Axiom help page
		20.9.3 fortran code
		20.9.4 lisp code
21		ACK - General Matrices, Linear Solve, Real 1825
	21.1	sgels
		21.1.1 Axiom unit tests
		21.1.2 Axiom help page
		21.1.3 fortran code
	01.0	21.1.4 lisp code
	21.2	sgelsd
		21.2.1 Axiom unit tests
		21.2.2 Axiom help page
		21.2.3 fortran code
	01.0	21.2.4 lisp code
	21.3	sgelss
		21.3.1 Axiom unit tests

		21.3.2	Axiom help page	. 1876
		21.3.3	fortran code	. 1879
		21.3.4	lisp code	. 1889
	21.4	sgelsx -	- DEPRECATED use sgelsy	. 1915
			Axiom unit tests	
			Axiom help page	
			fortran code	
			lisp code	
	21.6			
		_	Axiom unit tests	
			Axiom help page	
			fortran code	
			lisp code	
	21.7			
	21.1	_	Axiom unit tests	
			Axiom help page	
			fortran code	
	01.0		lisp code	
	21.0	_	x	
			Axiom help page	
		21.8.3	$ fortran\ code\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\$. 1905
		01 0 4	1: 1	1050
		21.8.4	lisp code	. 1970
99	Τ. Δ.Τ.		•	
		PACK -	- General Matrices, Linear Solve, Complex	1979
		PACK cgels .	- General Matrices, Linear Solve, Complex	1979 . 1979
		PACK cgels . 22.1.1	- General Matrices, Linear Solve, Complex Axiom unit tests	1979 . 1979 . 1979
		PACK cgels . 22.1.1 22.1.2	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page	1979 . 1979 . 1979 . 1979
		cgels . 22.1.1 22.1.2 22.1.3	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code	1979 . 1979 . 1979 . 1979 . 1982
	22.1	PACK cgels . 22.1.1 22.1.2 22.1.3 22.1.4	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code	1979 . 1979 . 1979 . 1979 . 1982 . 1988
	22.1	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998
	22.1	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998
	22.1	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 1998
	22.1	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 1998 . 2001
	22.122.2	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 1998 . 2001 . 2009
	22.122.2	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code.	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 1998 . 2001 . 2009 . 2031
	22.122.2	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom help page fortran code	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 2001 . 2009 . 2031 . 2031
	22.122.2	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1 22.3.2	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom help page fortran code lisp code Axiom unit tests Axiom unit tests	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 2001 . 2009 . 2031 . 2031
	22.122.2	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1 22.3.2 22.3.3	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom help page fortran code lisp code Axiom unit tests Axiom unit tests Axiom unit tests	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 2001 . 2009 . 2031 . 2031 . 2033
	22.122.222.3	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1 22.3.2 22.3.3 22.3.4	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code isp code lisp code	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 2001 . 2009 . 2031 . 2031 . 2033 . 2045
	22.122.222.322.4	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1 22.3.2 22.3.3 22.3.4 cgelsx	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code - DEPRECATED use cgelsy	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 2001 . 2009 . 2031 . 2031 . 2033 . 2045 . 2071
	22.122.222.322.4	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1 22.3.2 22.3.3 22.3.4 cgelsx cgelsy	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom unit tests Axiom help page fortran code lisp code - DEPRECATED use cgelsy	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 2001 . 2009 . 2031 . 2031 . 2033 . 2045 . 2071
	22.122.222.322.4	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1 22.3.2 22.3.3 22.3.4 cgelsx cgelsy 22.5.1	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code DEPRECATED use cgelsy Axiom unit tests	1979 1979 1979 1979 1982 1988 1998 1998 2001 2009 2031 2031 2033 2045 2071 2071
	22.122.222.322.4	cgels . 22.1.1 22.1.2 22.1.3 22.1.4 cgelsd 22.2.1 22.2.2 22.2.3 22.2.4 cgelss 22.3.1 22.3.2 22.3.3 22.3.4 cgelsx cgelsy 22.5.1 22.5.2	- General Matrices, Linear Solve, Complex Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom unit tests Axiom help page fortran code lisp code - DEPRECATED use cgelsy	1979 . 1979 . 1979 . 1979 . 1982 . 1988 . 1998 . 1998 . 2001 . 2009 . 2031 . 2031 . 2033 . 2045 . 2071 . 2071 . 2071

CONTENTS	255
----------	-----

	22.5.4 lisp code	. 2079
22.6	cgesv	. 2089
	22.6.1 Axiom unit tests	. 2089
	22.6.2 Axiom help page	. 2089
	22.6.3 fortran code	
	22.6.4 lisp code	. 2092
22.7	cgesvx	. 2094
	22.7.1 Axiom unit tests	. 2094
	22.7.2 Axiom help page	. 2094
	22.7.3 fortran code	. 2099
	22.7.4 lisp code	. 2104
22.8	cgesvxx	. 2113
	22.8.1 Axiom unit tests	. 2113
	22.8.2 Axiom help page [?]	. 2113
	22.8.3 fortran code	. 2121
	22.8.4 lisp code	. 2126
	PACK - General Matrices, Linear Solve, Complex16	2135
23.1	zcgesv	
	23.1.1 Axiom unit tests	
	23.1.2 Axiom help page	
	23.1.3 fortran code	
	23.1.4 lisp code	
23.2	zgels	. 2150
	23.2.1 Axiom unit tests	. 2150
	23.2.2 Axiom help page	. 2150
	23.2.3 fortran code	. 2153
	23.2.4 lisp code	. 2159
23.3	$zgelsd \dots \dots$. 2169
	23.3.1 Axiom unit tests	. 2169
	23.3.2 Axiom help page	. 2169
	23.3.3 fortran code	. 2172
	23.3.4 lisp code	. 2180
23.4	zgelss	. 2201
	23.4.1 Axiom unit tests	
	23.4.2 Axiom help page	
	23.4.3 fortran code	
	23.4.4 lisp code	
23.5	zgelsx - DEPRECATED use zgelsy	
	zgelsy	
_0.0	23.6.1 Axiom unit tests	
	23.6.2 Axiom help page	
	23.6.3 fortran code	
	23.6.4 lisp code	
23.7	zgesv	
20.1	23.7.1 Axiom unit tests	
	20.1.1 14.10111 unit 00505	. 4408

		23.7.2 Axiom help page	
		23.7.3 fortran code	61
		23.7.4 lisp code	62
	23.8	zgesvx	
		23.8.1 Axiom unit tests	
		23.8.2 Axiom help page	
		23.8.3 fortran code	
		23.8.4 lisp code	
	23.0	zgesvxx	
	20.3	23.9.1 Axiom unit tests	
		23.9.2 Axiom help page [?]	
		23.9.3 fortran code	
		23.9.4 lisp code	96
24	T A T	ACK - General Matrices, Eigenvalue , Double 230	۲
4 4		· · ·	
	24.1	dgees	
		24.1.1 Axiom unit tests	
		24.1.2 Axiom help page	
		24.1.3 fortran code	
		24.1.4 lisp code	
	24.2	dgeesx	
		24.2.1 Axiom unit tests	
		24.2.2 Axiom help page	
		24.2.3 fortran code	19
		24.2.4 lisp code	26
	24.3	dgeev	26
		24.3.1 Axiom unit tests	26
		24.3.2 Axiom help page	26
		24.3.3 fortran code	
		24.3.4 lisp code	
	24.4	dgeevx	
		24.4.1 Axiom unit tests	
		24.4.2 Axiom help page	
		24.4.3 fortran code	
		24.4.4 lisp code	
	24.5	dgegs - DEPRECATED use dgges	
		dgegv - DEPRECATED use dggev	
	24.1	dgges	
		24.7.1 Axiom unit tests	
		24.7.2 Axiom help page	
		24.7.3 fortran code	
	246	24.7.4 lisp code	
	24.8	dgges3	
		24.8.1 Axiom unit tests	
		24.8.2 Axiom help page	
		24.8.3 fortran code	64

CONTENTS	257

24.9.2 Axiom help page 24.9.3 fortran code 24.9.4 lisp code 24.10 dysev 24.10.1 Axiom unit tests 24.10.2 Axiom help page 24.10.3 fortran code 24.10.4 lisp code 24.11.4 lisp code 24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.12 Axiom help page 24.12.1 Axiom unit tests 24.12.2 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.4 lisp code 24.12.4 lisp code 25.1 sgees 25.1.1 Axiom unit tests 25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code 25.2 sgeesx 25.2.1 Axiom unit tests 25.2.2 Axiom help page 25.3 fortran code 25.3 sgeev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.4 lisp code		
24.9.1 Axiom unit tests 24.9.2 Axiom help page 24.9.3 fortran code 24.9.4 lisp code 24.10.4 lisp code 24.10.1 Axiom unit tests 24.10.2 Axiom help page 24.10.3 fortran code 24.11.4 lisp code 24.11.4 sip code 24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.11.4 lisp code 24.11.4 lisp code 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.12.1 Axiom unit tests 24.12.1 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.3 fortran code 25.1 system of tests 25.1 Axiom help page 25.1 fortran code 25.1 system of tests 25.1 Axiom help page 25.1 fortran code 25.1 system of tests 25.2 Axiom help page 25.3 fortran code 25.3 system 25.3 Axiom help page 25.3 system 25.3 Axiom help page 25.3 system 25.3 fortran code 25.3 system 25.3 Axiom help page 25.3 system 25.3 fortran code 25.3 system 25.4 Axiom unit tests 25.4 system 25.4 Axiom unit tests 25.4 system 25.4 Axiom help page 25.4 system 25.4	94.0	24.8.4 lisp code
24.9.2 Axiom help page 24.9.3 fortran code 24.9.4 lisp code 24.10 dysev 24.10.1 Axiom unit tests 24.10.2 Axiom help page 24.10.3 fortran code 24.10.4 lisp code 24.11.4 lisp code 24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.12 Axiom help page 24.12.1 Axiom unit tests 24.12.2 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.4 lisp code 24.12.4 lisp code 25.1 sgees 25.1.1 Axiom unit tests 25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code 25.2 sgeesx 25.2.1 Axiom unit tests 25.2.2 Axiom help page 25.3 fortran code 25.3 sgeev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.4 lisp code	$_{24.9}$	dggesx
24.9.3 fortran code 24.9.4 lisp code 24.10dggev 24.10.1 Axiom unit tests 24.10.2 Axiom help page 24.10.3 fortran code 24.10.4 lisp code 24.11.4 lisp code 24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.11.4 lisp code 24.11.4 sion unit tests 24.12.1 Axiom unit tests 24.12.1 Axiom unit tests 24.12.2 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.4 lisp code 24.12.4 lisp code 25.1.1 Axiom unit tests 25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code 25.2 sgeesx 25.1.4 lisp code 25.2.5 axiom help page 25.2.1 Axiom unit tests 25.2.2 Axiom help page 25.3.3 fortran code 25.3 sgeev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.5 axiom help page 25.3.5 fortran code 25.3.6 lisp code 25.3.7 Axiom unit tests 25.3.8 geev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.5 fortran code 25.3.5 fortran code 25.3.6 fortran code 25.3.7 Axiom unit tests 25.3.8 geevx 25.4.1 Axiom unit tests 25.4.2 Axiom help page 25.3.3 fortran code 25.4.4 lisp code		24.9.1 Axiom unit tests
24.9.3 fortran code 24.9.4 lisp code 24.10dggev 24.10.1 Axiom unit tests 24.10.2 Axiom help page 24.10.3 fortran code 24.10.4 lisp code 24.11.4 lisp code 24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.11.4 lisp code 24.11.4 sion unit tests 24.12.1 Axiom unit tests 24.12.1 Axiom unit tests 24.12.2 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.4 lisp code 24.12.4 lisp code 25.1.1 Axiom unit tests 25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code 25.2 sgeesx 25.1.4 lisp code 25.2.5 axiom help page 25.2.1 Axiom unit tests 25.2.2 Axiom help page 25.3.3 fortran code 25.3 sgeev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.5 axiom help page 25.3.5 fortran code 25.3.6 lisp code 25.3.7 Axiom unit tests 25.3.8 geev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.5 fortran code 25.3.5 fortran code 25.3.6 fortran code 25.3.7 Axiom unit tests 25.3.8 geevx 25.4.1 Axiom unit tests 25.4.2 Axiom help page 25.3.3 fortran code 25.4.4 lisp code		24.9.2 Axiom help page
24.9.4 lisp code		·
24.10.1 Axiom unit tests		
24.10.1 Axiom unit tests 24.10.2 Axiom help page 24.10.3 fortran code 24.10.4 lisp code 24.11.1 dxiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.11.4 lisp code 24.11.4 lisp code 24.11.4 lisp code 24.12.1 Axiom unit tests 24.12.1 Axiom unit tests 24.12.2 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.4 lisp code 24.12.4 lisp code 25.1.3 fortran code 25.1.4 xiom unit tests 25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code 25.2 sgeesx 25.2.1 Axiom unit tests 25.2.2 Axiom help page 25.2.3 fortran code 25.2.4 lisp code 25.2.4 lisp code 25.3 sgeev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.4 lisp code 25.3.5 sgeev 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.4.4 sgeevx 25.4.1 Axiom unit tests 25.4.2 Axiom help page 25.4.3 fortran code 25.4.4 lisp code		•
24.10.2 Axiom help page 24.10.3 fortran code 24.10.4 lisp code 24.11.1 gev3 24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.12.1 dxiom unit tests 24.12.1 Axiom unit tests 24.12.1 Axiom unit tests 24.12.2 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.4 lisp code 25.1.1 Axiom unit tests 25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code 25.1.4 lisp code 25.2 sgeesx 25.2.1 Axiom unit tests 25.2.2 Axiom help page 25.2.3 fortran code 25.2.4 lisp code 25.2.4 lisp code 25.2.5 sgeev 25.3.1 Axiom unit tests 25.2.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code 25.3.5 fortran code 25.3.5 fortran code 25.3.6 fortran code 25.3.7 Axiom unit tests 25.3.8 fortran code 25.3.9 fortran code 25.3.1 Axiom unit tests 25.3.1 Axiom unit tests 25.3.2 Axiom help page 25.3.3 fortran code 25.3.4 lisp code		
24.10.3 fortran code 24.10.4 lisp code 24.11dggev3 24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.12dggevx 24.12.1 Axiom unit tests 24.12.1 Axiom unit tests 24.12.2 Axiom help page 24.12.3 fortran code 24.12.4 lisp code LAPACK - General Matrices, Eigenvalue , Real 24.12.1 Axiom unit tests 25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code 25.1.4 lisp code 25.2 sgeesx 25.1.5 Axiom unit tests 25.2 Axiom help page 25.2.1 Axiom unit tests 25.2.2 Axiom help page 25.3 fortran code 25.3 Axiom help page 25.3 fortran code 25.4 sgeevx 25.4.1 Axiom unit tests 25.4.2 Axiom help page 25.4.3 fortran code		
24.10.4 lisp code 2 24.11.1 Axiom unit tests 2 24.11.2 Axiom unit tests 2 24.11.3 fortran code 2 24.11.4 lisp code 2 24.12.1 Axiom unit tests 2 24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2.2 Axiom unit tests 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.11dgev3 24.11.1 Axiom unit tests 24.11.1 Axiom help page 24.11.3 fortran code 24.11.4 lisp code 24.11.4 lisp code 24.12dgevx 24.12.1 Axiom unit tests 24.12.1 Axiom help page 24.12.3 fortran code 24.12.4 lisp code 24.12.4 lisp code LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.11.1 Axiom unit tests 24.11.2 Axiom help page 24.11.3 fortran code 2 24.11.4 lisp code 2 24.12.1 geven 2 24.12.1 Axiom unit tests 2 24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2.2 sgeesx 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2 25.4.4 lisp code 2		
24.11.2 Axiom help page 2 24.11.3 fortran code 2 24.12 diggevx 2 24.12.1 Axiom unit tests 2 24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2		
24.11.3 fortran code 2 24.12 dggevx 2 24.12.1 Axiom unit tests 2 24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.11.4 lisp code 2 24.12dggevx 2 24.12.1 Axiom unit tests 2 24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.2 Axiom unit tests 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.12dggevx 24.12.1 Axiom unit tests 24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.12.1 Axiom unit tests 2 24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.12.2 Axiom help page 2 24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2.2 Axiom unit tests 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.12.3 fortran code 2 24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
24.12.4 lisp code 2 LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees 2 25.1.1 Axiom unit tests 2 25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		24.12.2 Axiom help page
LAPACK - General Matrices, Eigenvalue , Real 24 25.1 sgees		
25.1.1 sgees 2 25.1.2 Axiom unit tests 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		24.12.4 lisp code
25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.1	
25.1.3 fortran code 2 25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		0F 1 1 A: :: 44
25.1.4 lisp code 2 25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		
25.2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		25.1.2 Axiom help page
25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		25.1.2 Axiom help page
25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2		25.1.2 Axiom help page 25.1.3 fortran code 25.1.4 lisp code
25.2.3 fortran code 2 25.2.4 lisp code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2
25.2.4 lisp code 2 25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2
25.3 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2
25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2
25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2
25.3.3 fortran code 2 25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2 25.3	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2
25.3.4 lisp code 2 25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2 25.3	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2
25.4 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2 25.3	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2
25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2 25.3	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2
25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2 25.3	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2
25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2	25.2 25.3	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2
25.4.3 fortran code	25.2 25.3	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2
25.4.4 lisp code	25.2 25.3 25.4	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 sgeevx 2
	25.2 25.3 25.4	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.2 Axiom help page 2
	25.2 25.3 25.4	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2
25.6 sgegv - DEPRECATED use sggev	25.2 25.3 25.4	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2
25.7 sgges	25.2 25.3 25.4 25.5	25.1.2 Axiom help page 2 25.1.3 fortran code 2 25.1.4 lisp code 2 sgeesx 2 25.2.1 Axiom unit tests 2 25.2.2 Axiom help page 2 25.2.3 fortran code 2 25.2.4 lisp code 2 sgeev 2 25.3.1 Axiom unit tests 2 25.3.2 Axiom help page 2 25.3.3 fortran code 2 25.3.4 lisp code 2 sgeevx 2 25.4.1 Axiom unit tests 2 25.4.2 Axiom help page 2 25.4.3 fortran code 2 25.4.4 lisp code 2 sgegs - DEPRECATED use sgges 2

	25.7.1 Axiom unit tests				
	25.7.2 Axiom help page				2542
	25.7.3 fortran code				2546
	25.7.4 lisp code				2554
25.8	8 sgges3				2554
	25.8.1 Axiom unit tests				2554
	25.8.2 Axiom help page				2554
	25.8.3 fortran code				2558
	25.8.4 lisp code				2565
25.9	9 sggesx				2566
	25.9.1 Axiom unit tests				
	25.9.2 Axiom help page				2566
	25.9.3 fortran code				
	25.9.4 lisp code				
25.1	10sggev				
	25.10.1 Axiom unit tests				
	25.10.2 Axiom help page				
	25.10.3 fortran code				
	25.10.4 lisp code				
25.1	11sggev3				
_0,1	25.11.1 Axiom unit tests				
	25.11.2 Axiom help page				
	25.11.3 fortran code				
	25.11.4 lisp code				
25.1	12sggevx				
20.1	25.12.1 Axiom unit tests				
	25.12.1 Axiom tulit tests				
	25.12.2 Axioni neip page				
	25.12.4 lisp code				
	25.12.4 lisp code				2043
26 LA	APACK - General Matrices, Eigenvalu	e , Compl	ex	2	2661
	1 cgees				2661
	$\overset{\circ}{26.1.1}$ Axiom unit tests				
	26.1.2 Axiom help page				
	26.1.3 fortran code				
	26.1.4 lisp code				
26.2	2 cgeesx				
	26.2.1 Axiom unit tests				2668
	26.2.2 Axiom help page				2669
	26.2.3 fortran code				
	26.2.4 lisp code				
26.3	3 cgeev				2677
۷۵.0	26.3.1 Axiom unit tests				$\frac{2677}{2677}$
	26.3.2 Axiom help page				2678
	26.3.3 fortran code				
	20.3.3 Tortrail code				2686

CONTENTS	25
CONTENTS	25

	26.4 cgeevx	2609
	26.4.1 Axiom unit tests	
	26.4.2 Axiom help page	
	26.4.3 fortran code	
	26.4.4 lisp code	
	26.5 cgegs - DEPRECATED use cgges	
	26.6 cgegv - DEPRECATED use cggev	
	26.7 cgges	. 2723
	26.7.1 Axiom unit tests	. 2723
	26.7.2 Axiom help page	. 2724
	26.7.3 fortran code	
	26.7.4 lisp code	
	26.8 cgges3	
	26.8.1 Axiom unit tests	
	26.8.2 Axiom help page	
	26.8.3 fortran code	
	26.8.4 lisp code	
	26.9 cggesx	
	26.9.1 Axiom unit tests	
	26.9.2 Axiom help page	
	26.9.3 fortran code	
	26.9.4 lisp code	
	26.10cggev	
	26.10.1 Axiom unit tests	
	26.10.2 Axiom help page	
	26.10.3 fortran code	
	26.10.4 lisp code	
	26.11cggev3	
	26.11.1 Axiom unit tests	. 2779
	26.11.2 Axiom help page	
	26.11.3 fortran code	. 2782
	26.11.4 lisp code	. 2789
	26.12cggevx	
	26.12.1 Axiom unit tests	
	26.12.2 Axiom help page	
	26.12.3 fortran code	
	26.12.4 lisp code	
27	LAPACK - General Matrices, Eigenvalue , Complex16	2833
	27.1 zgees	. 2833
	27.1.1 Axiom unit tests	
	27.1.2 Axiom help page	
	27.1.3 fortran code	
	27.1.4 lisp code	
	27.2 zgeesx	
	27.2.1 Axiom unit tests	
	21.2.1 Tition unit topus	. 2040

27.2.2 Axiom help page	
27.2.3 fortran code	2844
27.2.4 lisp code	2849
27.3 zgeev	2849
27.3.1 Axiom unit tests	2849
27.3.2 Axiom help page	2850
27.3.3 fortran code	2852
27.3.4 lisp code	2858
27.4 zgeevx	2872
27.4.1 Axiom unit tests	2872
27.4.2 Axiom help page	2873
27.4.3 fortran code	
27.4.4 lisp code	
27.5 zgegs - DEPRECATED use zgges	
27.6 zgegv - DEPRECATED use zggev	
27.7 zgges	
27.7.1 Axiom unit tests	
27.7.2 Axiom help page	
27.7.3 fortran code	
27.7.4 lisp code	
27.8 zgges3	
27.8.1 Axiom unit tests	
27.8.2 Axiom help page	
27.8.3 fortran code	
27.8.4 lisp code	
27.9 zggesx	
27.9.1 Axiom unit tests	
27.9.2 Axiom help page	
27.9.3 fortran code	
27.9.4 lisp code	
27.10zggev	
27.10.1 Axiom unit tests	
27.10.1 Axiom help page	
27.10.2 Axiom help page	
27.10.3 for train code	
27.11zggev3	
27.11.1 Axiom unit tests	
27.11.2 Axiom help page	
	2957
27.11.4 lisp code	2963
27.12zggevx	2977
27.12.1 Axiom unit tests	2977
110	2977
27.12.3 fortran code	2982
27/ 12 / han ende	.)(1(1)

2 8	LAF	PACK - General Matrices, Singular Value, Double	3007
	28.1	dgejsv	3007
		28.1.1 Axiom unit tests	3007
		28.1.2 Axiom help page	3007
		28.1.3 fortran code	3014
		28.1.4 lisp code	3039
	28.2	dgesdd	3100
		28.2.1 Axiom unit tests	
		28.2.2 Axiom help page	3101
		28.2.3 fortran code	
		28.2.4 lisp code	
	28.3	dgesvd	
		28.3.1 Axiom unit tests	
		28.3.2 Axiom help page	
		28.3.3 fortran code	
		28.3.4 lisp code	
	28 4	dgesvdx	
	20.4	28.4.1 Axiom unit tests	
		28.4.2 Axiom help page	
		28.4.3 fortran code	
		28.4.4 lisp code	
		20.4.4 hsp code	3223
29	LAF	PACK - General Matrices, Singular Value, Real	3247
		sgejsv	3247
		29.1.1 Axiom unit tests	
		29.1.2 Axiom help page	
		29.1.3 fortran code	
		29.1.4 lisp code	
	29.2	sgesdd	
		29.2.1 Axiom unit tests	
		29.2.2 Axiom help page	
		29.2.3 fortran code	
	29.3	29.2.4 lisp code	
	20.0	29.2.4 lisp code	3433
		sgesvd	
		sgesvd	3433
		sgesvd . 29.3.1 Axiom unit tests . 29.3.2 Axiom help page .	3433 3434
		sgesvd	3433 3434 3436
	20 A	sgesvd	3433 3434 3436 3497
	29.4	sgesvd 29.3.1 Axiom unit tests 29.3.2 Axiom help page 29.3.3 fortran code 29.3.4 lisp code sgesvdx	3433 3434 3436 3497 3619
	29.4	sgesvd	3433 3434 3436 3497 3619 3619
	29.4	sgesvd	3433 3434 3436 3497 3619 3620
	29.4	sgesvd	3433 3434 3436 3497 3619 3620 3623

30 LA	PACK - General Matrices, Singular Value, Complex	3655
30.1	cgejsv	
	30.1.1 Axiom unit tests	. 3655
	30.1.2 Axiom help page	. 3655
	30.1.3 fortran code	. 3663
	30.1.4 lisp code	. 3688
30.2	$\operatorname{cgesdd} \ldots \ldots$. 3750
	30.2.1 Axiom unit tests	. 3750
	30.2.2 Axiom help page	. 3750
	30.2.3 fortran code	. 3753
	30.2.4 lisp code	. 3787
30.3	cgesvd	. 3888
	30.3.1 Axiom unit tests	. 3888
	30.3.2 Axiom help page	. 3888
	30.3.3 fortran code	. 3891
	30.3.4 lisp code	. 3956
30.4	cgesvdx	. 4075
	30.4.1 Axiom unit tests	. 4075
	30.4.2 Axiom help page	. 4075
	30.4.3 fortran code	. 4078
	30.4.4 lisp code	. 4089
	PACK - General Matrices, Singular Value, Complex16	4111
	zgejsv	4111 . 4111
	zgejsv	4111 . 4111 . 4111
	zgejsv	4111 . 4111 . 4111 . 4111
	zgejsv	4111 . 4111 . 4111 . 4111 . 4119
31.1	zgejsv	4111 . 4111 . 4111 . 4111 . 4114
31.1	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd	4111 . 4111 . 4111 . 4111 . 4119 . 4144 . 4206
31.1	zgejsv	4111 . 4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206
31.1	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page	4111 . 4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4206
31.1	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4206
31.1 31.2	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4206 . 4209 . 4243
31.1 31.2	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code zgesvd	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339
31.1 31.2	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code zgesvd 31.3.1 Axiom unit tests	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339
31.1 31.2	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code zgesvd	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339
31.1 31.2	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code zgesvd 31.3.1 Axiom unit tests 31.3.2 Axiom help page 31.3.3 fortran code	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339 . 4342
31.1 31.2	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code zgesvd 31.3.1 Axiom unit tests 31.3.2 Axiom help page	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339 . 4342
31.1 31.2 31.3	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code zgesvd 31.3.1 Axiom unit tests 31.3.2 Axiom help page 31.3.3 fortran code	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339 . 4342 . 4406
31.1 31.2 31.3	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code zgesvd 31.3.1 Axiom unit tests 31.3.2 Axiom help page 31.3.3 fortran code 31.3.4 lisp code	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339 . 4342 . 4406 . 4525
31.1 31.2 31.3	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code zgesvd 31.3.1 Axiom unit tests 31.3.2 Axiom help page 31.3.3 fortran code 31.3.4 lisp code zgesvdx	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339 . 4342 . 4406 . 4525 . 4525
31.1 31.2 31.3	zgejsv 31.1.1 Axiom unit tests 31.1.2 Axiom help page 31.1.3 fortran code 31.1.4 lisp code zgesdd 31.2.1 Axiom unit tests 31.2.2 Axiom help page 31.2.3 fortran code 31.2.4 lisp code zgesvd 31.3.1 Axiom unit tests 31.3.2 Axiom help page 31.3.3 fortran code 31.3.4 lisp code zgesvdx 31.4.1 Axiom unit tests	4111 . 4111 . 4111 . 4119 . 4144 . 4206 . 4206 . 4209 . 4243 . 4339 . 4339 . 4342 . 4406 . 4525 . 4525

32 LA	APACK - General Matrices, Comp. Routines, Do	ouble	4561
	1 dgebak		. 4561
	32.1.1 Axiom unit tests		. 4561
	32.1.2 Axiom help page		. 4561
	32.1.3 fortran code		
	32.1.4 lisp code		
32.2	2 dgebal		
	32.2.1 Axiom unit tests		
	32.2.2 Axiom help page		
	32.2.3 fortran code		
	32.2.4 lisp code		
32.3	3 dgebd2		
	32.3.1 Axiom unit tests		
	32.3.2 Axiom help page		
	32.3.3 fortran code		
	32.3.4 lisp code		
32.4	4 dgebrd		
02.1	32.4.1 Axiom unit tests		
	32.4.2 Axiom help page		
	32.4.3 fortran code		
	32.4.4 lisp code		
32.5	5 dgecon		
32.0	32.5.1 Axiom unit tests		
	32.5.2 Axiom help page		
	32.5.3 fortran code		
	32.5.4 lisp code		
20.6	6 dgeequ		
32.0			
	32.6.1 Axiom unit tests		
	32.6.2 Axiom help page		
	32.6.3 fortran code		
00.5	32.6.4 lisp code		
32.7	7 dgeequb		
	32.7.1 Axiom unit tests		
	32.7.2 Axiom help page		
	32.7.3 fortran code		
	32.7.4 lisp code		
32.8	8 dgehd2		
	32.8.1 Axiom unit tests		
	32.8.2 Axiom help page		. 4611
	32.8.3 fortran code		. 4613
	32.8.4 lisp code		. 4615
32.9	9 dgehrd		. 4615
	32.9.1 Axiom unit tests		. 4615
	32.9.2 Axiom help page		. 4615
	32.9.3 fortran code		
	32.9.4 lisp code		

$32.10 dgelq2 \dots \dots$	
32.10.1 Axiom unit tests	4621
32.10.2 Axiom help page	4622
32.10.3 fortran code	4623
32.10.4 lisp code	4625
32.11dgelqf	4625
32.11.1 Axiom unit tests	4625
32.11.2 Axiom help page	4625
32.11.3 fortran code	
32.11.4 lisp code	
32.12dgemqrt	
32.12.1 Axiom unit tests	
32.12.2 Axiom help page	
32.12.3 fortran code	
32.12.4 lisp code	
32.13dgeql2	
32.13.1 Axiom unit tests	
32.13.2 Axiom help page	
32.13.3 fortran code	
32.13.4 lisp code	
32.14dgeqlf	
32.14.1 Axiom unit tests	
32.14.2 Axiom help page	
32.14.3 fortran code	
32.14.4 lisp code	
32.15dgeqp3	
32.15.1 Axiom unit tests	
32.15.2 Axiom help page	
$32.15.3 \mathrm{fortran} \mathrm{code} \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	
32.15.4 lisp code	
32.16dgeqpf - DEPRECATED use dgeqp3	
32.17dgeqr2	4665
32.17.1 Axiom unit tests	4665
32.17.2 Axiom help page	
32.17.3 fortran code	4667
32.17.4 lisp code	4669
32.18dgeqr2p	4670
32.18.1 Axiom unit tests	4670
32.18.2 Axiom help page [?]	4671
32.18.3 fortran code	
32.18.4 lisp code	
32.19dgeqrf	
32.19.1 Axiom unit tests	
32.19.2 Axiom help page	
32.19.3 fortran code	
32.19.4 lisp code	
02.10.1mp code	1000

265

32.20dgeqrfp	84
32.20.1 Axiom unit tests	
32.20.2 Axiom help page [?]	84
32.20.3 fortran code	
32.20.4 lisp code	88
32.21dgeqrt	92
32.21.1 Axiom unit tests	92
32.21.2 Axiom help page	92
32.21.3 fortran code	
32.21.4 lisp code	
32.22dgeqrt2	
32.22.1 Axiom unit tests	
32.22.2 Axiom help page	
32.22.3 fortran code	
32.22.4 lisp code	
32.23dgeqrt3	
32.23.1 Axiom unit tests	
32.23.2 Axiom help page [?]	
32.23.3 fortran code	
32.23.4 lisp code	
32.24dgerfs	
32.24.1 Axiom unit tests	
32.24.2 Axiom help page	
32.24.3 fortran code	
32.24.4 lisp code	
32.25dgerfsx	
32.25.1 Axiom unit tests	
32.25.2 Axiom help page [?]	
32.25.3 fortran code	
32.25.4 lisp code	
32.26dgerq2	
32.26.1 Axiom unit tests	
32.26.2 Axiom help page	
32.26.3 fortran code	
32.26.4 lisp code	
32.27dgerqf	
32.27.1 Axiom unit tests	
32.27.2 Axiom help page	
32.27.3 fortran code	
32.27.4 lisp code	
32.28dgesvj	
32.28.1 Axiom unit tests	
32.28.2 Axiom help page	
32.28.3 fortran code	
32.28.4 lisp code	
$32.29 dgetf2 \dots 48$	49

$32.29.1\mathrm{Axiom}$ unit tests .																					
$32.29.2\mathrm{Axiom}$ help page .																					
$32.29.3 \text{fortran code} \dots \dots$																					
$32.29.4 \operatorname{lisp\ code}$																					
$32.30 dgetrf \dots \dots$																					
32.30.1 Axiom unit tests .																					
$32.30.2\mathrm{Axiom}$ help page .																					
32.30.3 fortran code																					
$32.30.4 \operatorname{lisp\ code}$																					
32.31 dgetrf $2 \dots \dots \dots$																					
32.31.1 Axiom unit tests .																					
$32.31.2\mathrm{Axiom}$ help page .																					
32.31.3 fortran code																					
$32.31.4 \operatorname{lisp\ code}$																					
32.32dgetri																					
32.32.1 Axiom unit tests.																					
$32.32.2\mathrm{Axiom\ help\ page}$.									 												4869
32.32.3 fortran code									 												4870
$32.32.4 \operatorname{lisp\ code}$									 												4873
32.33dgetrs									 												4878
$32.33.1\mathrm{Axiom}$ unit tests .									 												4878
$32.33.2\mathrm{Axiom\ help\ page}$.									 												4878
32.33.3 fortran code									 												4879
32.33.4 lisp code									 												4881
32.34dhgeqz									 												4882
32.34.1 Axiom unit tests .									 												4882
32.34.2 Axiom help page [?]									 												4882
32.34.3 fortran code									 												4886
32.34.4 lisp code									 												4906
32.35dla_geamv																					
32.35.1 Axiom unit tests .																					
32.35.2 Axiom help page .									 												4948
32.35.3 fortran code																					
32.35.4 lisp code																					
32.36dla_gercond																					
32.36.1 Axiom unit tests .																					
32.36.2 Axiom help page .																					
32.36.3 fortran code																					4962
32.36.4 lisp code																					4966
32.37dla_gerfsx_extended																					4972
32.37.1 Axiom unit tests .																					4972
32.37.2 Axiom help page [?]																					4972
32.37.3 fortran code																					4978
32.37.4 lisp code																					
32.38dla_gerpvgrw																					
32.38 1 Axiom unit tosts	•	•	•	•	•	 •	•	•	 •	•	 •	•	 •	•	•	•	•	•	•	•	4001

CONTENTS	267

	32.38.2 Axiom help page	. 4991
	32.38.3 fortran code	
	32.38.4 lisp code	
32.39	9 dt gevc	
	32.39.1 Axiom unit tests	. 4994
	32.39.2 Axiom help page	
	32.39.3 fortran code	
	32.39.4 lisp code	. 5016
32.40	0 dt gexc	
	32.40.1 Axiom unit tests	
	32.40.2 Axiom help page	
	32.40.3 fortran code	
	32.40.4 lisp code	
32.4	1zgesvj	
	32.41.1 Axiom unit tests	
	32.41.2 Axiom help page	
	32.41.3 fortran code	
	32.41.4 lisp code	
	PACK - General Matrices, Comp. Routines, Real	5141
33.1	sgebak	
	33.1.1 Axiom unit tests	
	33.1.2 Axiom help page	
	33.1.3 fortran code	
	33.1.4 lisp code	
33.2	sgebal	. 5150
	33.2.1 Axiom unit tests	
	33.2.2 Axiom help page	. 5150
		. 5150
	33.2.2 Axiom help page	. 5150 . 5152
33.3	33.2.2 Axiom help page	515051525157
33.3	33.2.2 Axiom help page	5150515251575163
33.3	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2	51505152515751635163
33.3	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests	51505152515751635163
33.3	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page	. 5150 . 5152 . 5157 . 5163 . 5163 . 5163
	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5166
	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173
	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173
	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd	. 5150 . 5152 . 5157 . 5163 . 5163 . 5163 . 5169 . 5173 . 5173
	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests 33.4.2 Axiom help page 33.4.3 fortran code	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173 . 5173
33.4	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests 33.4.2 Axiom help page 33.4.3 fortran code 33.4.4 lisp code	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173 . 5176 . 5176
33.4	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests 33.4.2 Axiom help page 33.4.3 fortran code 33.4.4 lisp code sgecon	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173 . 5176 . 5179 . 5184
33.4	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests 33.4.2 Axiom help page 33.4.3 fortran code 33.4.4 lisp code sgecon 33.5.1 Axiom unit tests	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173 . 5176 . 5179 . 5184 . 5184
33.4	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests 33.4.2 Axiom help page 33.4.3 fortran code 33.4.4 lisp code sgecon 33.5.1 Axiom unit tests 33.5.2 Axiom help page	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173 . 5176 . 5179 . 5184 . 5184 . 5184
33.4	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests 33.4.2 Axiom help page 33.4.3 fortran code 33.4.4 lisp code sgecon 33.5.1 Axiom unit tests 33.5.2 Axiom help page 33.5.3 fortran code	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173 . 5176 . 5179 . 5184 . 5184 . 5184 . 5186
33.4	33.2.2 Axiom help page 33.2.3 fortran code 33.2.4 lisp code sgebd2 33.3.1 Axiom unit tests 33.3.2 Axiom help page 33.3.3 fortran code 33.3.4 lisp code sgebrd 33.4.1 Axiom unit tests 33.4.2 Axiom help page 33.4.3 fortran code 33.4.4 lisp code sgecon 33.5.1 Axiom unit tests 33.5.2 Axiom help page	. 5150 . 5152 . 5157 . 5163 . 5163 . 5166 . 5169 . 5173 . 5173 . 5176 . 5179 . 5184 . 5184 . 5184 . 5186 . 5188

33.6.1 Axiom unit tests	192
33.6.2 Axiom help page	192
33.6.3 fortran code	194
33.6.4 lisp code	197
	200
***************************************	200
**************************************	201
	202
	206
-0	210
	210
	210
	212
33.8.4 lisp code	
33.9 sgehrd	
	216
	216
33.9.3 fortran code	
33.9.4 lisp code	
33.10 sgelq $2 \dots \dots$	228
***************************************	228
33.10.2 Axiom help page	
33.10.3 fortran code	
$33.10.4 \operatorname{lisp\ code}$	
33.11sgelqf	
33.11.1 Axiom unit tests	
33.11.2 Axiom help page	
33.11.3 fortran code	235
33.11.4 lisp code	
33.12sgemqrt	
33.12.1 Axiom unit tests	241
33.12.2 Axiom help page	
33.12.3 fortran code	243
$33.12.4 \operatorname{lisp\ code}$	246
33.13 sgeql $2 \dots \dots$	
33.13.1 Axiom unit tests	250
33.13.2 Axiom help page	251
33.13.3 fortran code	252
33.13.4 lisp code	254
O I	256
33.14.1 Axiom unit tests	256
33.14.2 Axiom help page	256
33.14.3 fortran code	258
33.14.4 lisp code	261
	264
· -	264

CONTENTS	269
----------	-----

33.15.2 Axiom help page
33.15.3 fortran code
33.15.4 lisp code
33.16sgeqpf - DEPRECATED use sgeqp3
33.17sgeqr2
33.17.1 Axiom unit tests
33.17.2 Axiom help page
33.17.3 fortran code
33.17.4 lisp code
33.18sgeqr2p
33.18.1 Axiom unit tests
33.18.2 Axiom help page [?]
33.18.3 fortran code
33.18.4 lisp code
33.19sgeqrf
33.19.1 Axiom unit tests
33.19.2 Axiom help page
33.19.3 fortran code
33.19.4 lisp code
33.20sgeqrfp
33.20.1 Axiom unit tests
33.20.2 Axiom help page [?]
33.20.3 fortran code
33.20.4 lisp code
33.21sgeqrt
33.21.1 Axiom unit tests
33.21.2 Axiom help page
33.21.3 fortran code
33.21.4 lisp code
33.22sgeqrt2
33.22.1 Axiom unit tests
33.22.2 Axiom help page
33.22.3 fortran code
33.22.4 lisp code
33.23sgeqrt3
33.23.1 Axiom unit tests
33.23.2 Axiom help page [?]
33.23.3 fortran code
33.23.4 lisp code
33.24sgerfs
33.24.1 Axiom unit tests
33.24.2 Axiom help page
33.24.3 fortran code
33.24.4 lisp code
33.25sgerfsx
33.25.1 Axiom unit tests

33.25.2 Axiom help page [3	?]				 		 		 			 5340
$33.25.3 \text{fortran code} \dots \dots$					 		 		 			 5346
33.25.4 lisp code					 		 		 			 5352
$33.26 \operatorname{sgerq} 2 \dots \dots \dots \dots$					 		 		 			 5352
33.26.1 Axiom unit tests .					 		 		 			 5352
33.26.2 Axiom help page .					 		 		 			 5353
33.26.3 fortran code												
$33.26.4 \operatorname{lisp\ code}$												
33.27sgerqf												
33.27.1 Axiom unit tests .												
33.27.2 Axiom help page .												
33.27.3 fortran code												
33.27.4 lisp code												
33.28sgesvj												
33.28.1 Axiom unit tests .												
$33.28.2\mathrm{Axiom}$ help page .												
33.28.3 fortran code												
33.28.4 lisp code												
1												
33.29sgetf2												
33.29.2 Axiom help page .												
33.29.3 fortran code												
33.29.4 lisp code												
33.30sgetrf												
33.30.1 Axiom unit tests .												
$33.30.2\mathrm{Axiom\ help\ page}$.												
$33.30.3 \text{fortran code} \dots \dots$												
33.30.4 lisp code												
33.31 sgetrf $2 \dots \dots \dots \dots$												
33.31.1 Axiom unit tests.					 		 		 			 5473
33.31.2 Axiom help page.												
33.31.3 fortran code					 		 		 			 5475
33.31.4 lisp code					 		 		 			 5478
33.32sgetri					 		 		 			 5481
33.32.1 Axiom unit tests .					 		 		 			 5481
33.32.2 Axiom help page .					 		 		 			 5481
33.32.3 fortran code												
$33.32.4 \operatorname{lisp\ code}$												
33.33sgetrs												
33.33.1 Axiom unit tests .												
33.33.2 Axiom help page .												
33.33.3 fortran code												
33.33.4 lisp code												
33.34shgeqz												
33.34.1 Axiom unit tests .												
33 34 2 Axiom help page [2		• •	•	 •	 	 •	 	•	 	•	 •	 5497
00.04.4 A XIOHI HEHI DASE II												.1471

271

$33.34.3\mathrm{fortran}$ code														
$33.34.4 \operatorname{lisp\ code}$														
33.35 sla_geamv														
33.35.1 Axiom unit tests	·						 							5562
33.35.2 Axiom help page	·						 							5563
33.35.3 fortran code							 							5565
33.35.4 lisp code							 							5569
33.36 sla_gercond							 							5575
33.36.1 Axiom unit tests	·						 							5575
33.36.2 Axiom help page	·						 							5575
33.36.3 fortran code														
33.36.4 lisp code														
33.37sla_gerfsx_extended														
33.37.1 Axiom unit tests														
33.37.2 Axiom help page														
33.37.3 fortran code														
33.37.4 lisp code														
33.38sla_gerpvgrw														
33.38.1 Axiom unit tests														
33.38.2 Axiom help page														
33.38.3 fortran code														
33.38.4 lisp code														
33.39stgevc														
33.39.1 Axiom unit tests														
33.39.2 Axiom help page														
33.39.3 fortran code														
33.39.4 lisp code														
33.40stgexc														
33.40.1 Axiom unit tests														
33.40.2 Axiom help page														
33.40.3 fortran code														
33.40.4 lisp code		•		 •			 			 •		•	•	5674
24 I ADACK Commal Mate			٦.,	 т) a.	_+:_	 C.	 1 <i>-</i> -					۲	683
34 LAPACK - General Matra 34.1 cgebak														
34.1.1 Axiom unit tests														
34.1.2 Axiom help page														
34.1.3 fortran code														5685
34.1.4 lisp code														5688
34.2 cgebal														5692
34.2.1 Axiom unit tests														5692
34.2.2 Axiom help page														5692
34.2.3 fortran code														5695
34.2.4 lisp code														5699
$34.3 \text{ cgebd2} \dots \dots$														5706
34.3.1 Axiom unit tests	·						 							5706

34.3.2 Axiom help page	
34.3.3 fortran code	
34.3.4 lisp code	
34.4 cgebrd	717
34.4.1 Axiom unit tests	717
34.4.2 Axiom help page	717
34.4.3 fortran code	720
34.4.4 lisp code	723
34.5 cgecon	728
34.5.1 Axiom unit tests	728
34.5.2 Axiom help page	728
34.5.3 fortran code	
34.5.4 lisp code	732
34.6 cgeequ	
34.6.1 Axiom unit tests	
34.6.2 Axiom help page	
34.6.3 fortran code	
34.6.4 lisp code	
34.7 cgeequb	
34.7.1 Axiom unit tests	
34.7.2 Axiom help page	
34.7.2 Taxion help page	
34.7.4 lisp code	
34.8 cgehd2	
34.8.1 Axiom unit tests	
34.8.2 Axiom help page	
34.8.3 fortran code	
34.8.4 lisp code	
	761
	761
*	761
	763
	767
34.10cgelq2	
34.10.1 Axiom unit tests	
34.10.2 Axiom help page	
$34.10.3 \text{fortran code} \dots \dots \dots \dots \dots \dots \dots \dots \dots $	775
34.10.4 lisp code	776
- 0.1	778
34.11.1 Axiom unit tests	778
34.11.2 Axiom help page	779
34.11.3 fortran code	780
34.11.4 lisp code	783
34.12cgemqrt	786
34.12.1 Axiom unit tests	786
34.12.2 Axiom help page	787

CONTENTS	273
----------	-----

34.12.3 fortran code	
34.12.4 lisp code	
34.13cgeql2	
34.13.1 Axiom unit tests	
34.13.2 Axiom help page	
34.13.3 fortran code	
34.13.4 lisp code	
34.14cgeqlf	
34.14.1 Axiom unit tests	
34.14.2 Axiom help page	
34.14.3 fortran code	
34.14.4 lisp code	
34.15cgeqp3	
34.15.1 Axiom unit tests	
34.15.2 Axiom help page	
34.15.3 fortran code	
34.15.4 lisp code	
34.16cgeqpf - DEPRECATED use cgeqp3	
34.17cgeqr2	
34.17.1 Axiom unit tests	
34.17.2 Axiom help page	
34.17.3 fortran code	
34.17.4 lisp code	
34.18cgeqr2p	
34.18.1 Axiom unit tests	
34.18.2 Axiom help page [?]	
34.18.3 fortran code	
34.18.4 lisp code	
34.19cgeqrf	
34.19.1 Axiom unit tests	
34.19.2 Axiom help page	
34.19.3 fortran code	
34.19.4 lisp code	
34.20cgeqrfp	
34.20.1 Axiom unit tests	
34.20.2 Axiom help page [?]	
34.20.3 fortran code	
34.20.4 lisp code	
34.21cgeqrt	
34.21.1 Axiom unit tests	
34.21.2 Axiom help page	
34.21.3 fortran code	
34.21.4 lisp code	
34.22cgeqrt2	
34.22.1 Axiom unit tests	
34.22.2 Axiom help page	

$34.22.3 \text{fortran code} \dots \dots$																			
$34.22.4 \operatorname{lisp\ code} \dots \dots$																			
34.23cgeqrt 3																			
34.23.1 Axiom unit tests .																			
34.23.2 Axiom help page [3	-																		
$34.23.3 \text{fortran code} \dots \dots$																			
34.23.4 lisp code																			
34.24cgerfs																			
34.24.1 Axiom unit tests .																			
$34.24.2\mathrm{Axiom}$ help page .				 							 							. !	5871
$34.24.3 \text{fortran code} \dots \dots$. !	5874
$34.24.4 \operatorname{lisp\ code} \dots \dots$. !	5879
34.25cgerfsx				 							 							. !	5886
34.25.1 Axiom unit tests .				 							 							. !	5886
34.25.2 Axiom help page [3	?]			 							 							. !	5886
$34.25.3 \text{fortran code} \dots \dots$. !	5892
34.25.4 lisp code				 							 							. !	5899
34.26cgerq2				 							 							. !	5899
34.26.1 Axiom unit tests .																			
$34.26.2\mathrm{Axiom}$ help page .				 							 								5899
34.26.3 fortran code																			5901
34.26.4 lisp code				 							 								5902
34.27cgerqf																			5904
34.27.1 Axiom unit tests .																			5904
34.27.2 Axiom help page .				 							 							. !	5905
34.27.3 fortran code																			5907
34.27.4 lisp code																			5909
34.28cgesvj																			5913
34.28.1 Axiom unit tests .																			5913
34.28.2 Axiom help page .																			5914
34.28.3 fortran code																			5918
34.28.4 lisp code																			5938
34.29cgetf2																			5984
34.29.1 Axiom unit tests .																			5984
34.29.2 Axiom help page .																			5984
34.29.3 fortran code																			5985
$34.29.4 \operatorname{lisp code} \dots \dots$																			
34.30cgetrf																			5990
34.30.1 Axiom unit tests .																			5990
34.30.2 Axiom help page .																			5990
34.30.3 fortran code																			5992
34.30.4 lisp code																			5994
34.31cgetrf2																			5997
34.31.1 Axiom unit tests .																			
34.31.2 Axiom help page .																			5998
34.31.3 fortran code	•	•	•	 	•	•	•	 •	 •	•	 	•	•	•	 •	•	•		5000

CONTENTS	275
----------	-----

34.31.4 lisp code				 							 						 . (6003
34.32cgetri				 							 						 . (6006
34.32.1 Axiom unit tests				 							 						 . (6006
34.32.2 Axiom help page				 							 						 . (6006
34.32.3 fortran code																		
34.32.4 lisp code																		
34.33cgetrs																		
34.33.1 Axiom unit tests																		
34.33.2 Axiom help page																		
34.33.3 fortran code																		
34.33.4 lisp code																		
34.34chgeqz																		
34.34.1 Axiom unit tests																		
34.34.2 Axiom help page																		
34.34.3 fortran code																		
34.34.4 lisp code																		
34.35cla_geamv																		
34.35.1 Axiom unit tests																		
34.35.2 Axiom help page																		
34.35.3 fortran code																		
34.35.4 lisp code																		
34.36cla_gercond_c																		
34.36.1 Axiom unit tests																		
34.36.2 Axiom help page																		
34.36.3 fortran code																		
34.36.4 lisp code																		
34.37cla_gercond_x																		
34.37.1 Axiom unit tests																		
34.37.2 Axiom help page																		
34.37.3 fortran code																		
34.37.4 lisp code																		
34.38cla_gerfsx_extended																		
34.38.1 Axiom unit tests																		
34.38.2 Axiom help page																		
34.38.3 fortran code																		
34.38.4 lisp code																		
34.39cla_gerpvgrw																		
34.39.1 Axiom unit tests	 -	-	-	 	-	-	-	 -	-	 -	 	-	-	 -	-	-		
34.39.2 Axiom help page																		
34.39.3 fortran code																		
34.39.4 lisp code																		
34.40ctgevc																		
34.40.1 Axiom unit tests																		
34.40.2 Axiom help page																		
34.40.3 fortran code																		
34.40.4 lisp code				 							 						 . (6131

	34.41	ctgexc	
		34.41.1 Axiom unit tests	6145
		34.41.2 Axiom help page	6146
		34.41.3 fortran code	6148
		34.41.4 lisp code	6150
35		,	153
	35.1	zgebak	
		35.1.1 Axiom unit tests	
		35.1.2 Axiom help page	6153
		35.1.3 fortran code	6155
		35.1.4 lisp code	6158
	35.2	zgebal	6158
		35.2.1 Axiom unit tests	6158
		35.2.2 Axiom help page	6158
		35.2.3 fortran code	6160
		35.2.4 lisp code	6165
	35.3	zgebd2	6165
		35.3.1 Axiom unit tests	6165
		35.3.2 Axiom help page	6165
		35.3.3 fortran code	
		35.3.4 lisp code	6171
	35.4	zgebrd	6176
		35.4.1 Axiom unit tests	6176
		35.4.2 Axiom help page	6176
		35.4.3 fortran code	
		35.4.4 lisp code	
	35.5	zgecon	
		35.5.1 Axiom unit tests	6187
		35.5.2 Axiom help page	
		35.5.3 fortran code	
		35.5.4 lisp code	
	35.6	zgeequ	
		35.6.1 Axiom unit tests	6196
		35.6.2 Axiom help page	
		35.6.3 fortran code	
		35.6.4 lisp code	
	35.7	zgeequb	
		35.7.1 Axiom unit tests	
		35.7.2 Axiom help page	
		35.7.3 fortran code	
		35.7.4 lisp code	
	35.8	zgehd2	
	-	35.8.1 Axiom unit tests	
		35.8.2 Axiom help page	
		35.8.3 fortran code	

CONTENTS	277
----------	-----

35.8.4 lisp code	
35.9 zgehrd	
35.9.1 Axiom unit tests	
35.9.2 Axiom help page	
35.9.3 fortran code	
35.9.4 lisp code	
35.10zgelq2	
35.10.1 Axiom unit tests	
35.10.2 Axiom help page	
35.10.3 fortran code	
35.10.4 lisp code	
35.11zgelqf	
35.11.1 Axiom unit tests	
35.11.2 Axiom help page	
35.11.3 fortran code	
35.11.4 lisp code	
35.12zgemqrt	
35.12.1 Axiom unit tests	
35.12.2 Axiom help page	
35.12.3 fortran code	
35.12.4 lisp code	
35.13zgeql2	
35.13.1 Axiom unit tests	
35.13.2 Axiom help page	
35.13.3 fortran code	
35.13.4 lisp code	
35.14zgeqlf	
35.14.1 Axiom unit tests	
35.14.2 Axiom help page	
35.14.3 fortran code	
35.14.4 lisp code	
35.15zgeqp3	
35.15.1 Axiom unit tests	
35.15.2 Axiom help page	
35.15.3 fortran code	
35.15.4 lisp code	
35.16zgeqpf - DEPRECATED use zgeqp3	
35.17zgeqr2	
35.17.1 Axiom unit tests	
35.17.2 Axiom help page	
35.17.3 fortran code	
35.17.4 lisp code	
35.18zgeqr2p	
35.18.1 Axiom unit tests	
35.18.2 Axiom help page [?]	
35.18.3 fortran code	
55.25.5 25.25.25.25.25.25.25.25.25.25.25.25.25.2	

	35.18.4 lisp code	6283
35.	9zgeqrf	6284
	35.19.1 Axiom unit tests	6284
	35.19.2 Axiom help page	6285
	35.19.3 fortran code	6286
	35.19.4 lisp code	6289
35.	0zgeqrfp	6293
	35.20.1 Axiom unit tests	6293
	35.20.2 Axiom help page [?]	6293
	1	6295
	35.20.4 lisp code	6297
35.	•	6301
	~ -	6301
	35.21.2 Axiom help page	6301
		6303
		6305
35.	1	6307
	0 1	6307
		6308
	110	6309
		6311
35.	<u>.</u>	6314
	~ -	6314
		6315
		6316
		6319
35	-	6324
00.		6324
		6324
	1 1 0	6326
		6332
35	1	6339
55.		6339
		6339
		6345
		6351
25	6zgerq2	
55.		6352
		6352
	201-201-201-201-201-201-201-201-201-201-	6354
		6355
25	•	
3 0.	0 1	$6357 \\ 6357$
		035 <i>1</i> 6358
	1 1 0	
		6359
	22 77 71 USD 2000	

CONTENTS	279

35.28zgetf2	366
35.28.1 Axiom unit tests	366
35.28.2 Axiom help page	366
35.28.3 fortran code	368
35.28.4 lisp code	370
35.29zgetrf	373
35.29.1 Axiom unit tests	373
35.29.2 Axiom help page	373
35.29.3 fortran code	374
35.29.4 lisp code	
35.30zgetrf2	
35.30.1 Axiom unit tests	
35.30.2 Axiom help page	
35.30.3 fortran code	
35.30.4 lisp code	
35.31zgetri	
35.31.1 Axiom unit tests	
35.31.2 Axiom help page	
35.31.3 fortran code	
35.31.4 lisp code	
35.32zgetrs	
35.32.1 Axiom unit tests	
35.32.2 Axiom help page	
35.32.3 fortran code	
35.32.4 lisp code	
35.33zhgeqz	
35.33.1 Axiom unit tests	
35.33.2 Axiom help page [?]	
35.33.3 fortran code	
35.33.4 lisp code	
35.34zla_geamv	
· ·	
35.34.1 Axiom unit tests	
35.34.2 Axiom help page	
35.34.3 fortran code	
35.34.4 lisp code	
35.35zla_gercond_c	
35.35.1 Axiom unit tests	
35.35.2 Axiom help page	
35.35.3 fortran code	
<u>.</u>	162
0	167
	168
35.36.2 Axiom help page	168
35.36.3 fortran code	170
35.36.4 lisp code	173
35.37zla_gerfsx_extended	177

		35.37.1	Axiom unit test	s .	•		 	 				 				•	0411
		35.37.2	Axiom help pag	ge [?]		 	 				 					6478
		35.37.3	fortran code				 	 				 					6483
		35.37.4	lisp code				 	 				 					6489
	35.38	8zla_gerp	ovgrw				 	 				 					6497
		35.38.1	Axiom unit test	s .			 	 				 					6497
		35.38.2	Axiom help pag	ge .			 	 				 					6497
		35.38.3	fortran code				 	 				 					6498
			lisp code														
	35.39																
		35.39.1	Axiom unit test	s .			 	 				 					6501
		35.39.2	Axiom help pag	ge .			 	 				 					6501
		35.39.3	fortran code				 	 				 					6504
		35.39.4	lisp code				 	 				 					6514
	35.40	0ztgexc					 	 				 					6529
		35.40.1	Axiom unit test	s .			 	 				 					6529
		35.40.2	Axiom help pag	ge .			 	 				 					6529
		35.40.3	fortran code	٠.			 	 				 					6531
			lisp code														
36			General Mat				-										537
	36.1																
			Axiom unit test														
		36.1.2	Axiom help pag	ge .			 					 					6537
			\														
		36.1.3	fortran code														
		36.1.3 36.1.4	lisp code				 	 				 					6540
	36.2	36.1.3 36.1.4 dgetc2	$\begin{array}{cccccccccccccccccccccccccccccccccccc$				 	 				 					$6540 \\ 6543$
	36.2	36.1.3 36.1.4 dgetc2 36.2.1	lisp code Axiom unit test	 			 	 			 	 	· ·	•			6540 6543 6543
	36.2	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2	lisp code Axiom unit test Axiom help pag	 ge .		 	 	 	 	 	 	 			 		6540 6543 6543
	36.2	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3	lisp code Axiom unit test Axiom help pag fortran code	 ge .		 	 	 	 		 	 					6540 6543 6543 6543 6545
		36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4	lisp code Axiom unit test Axiom help pag fortran code lisp code			 	 	 	 		 	 			· · · · · · · ·		6540 6543 6543 6545 6547
		36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange	lisp code			 	 	 	 		 	 					6540 6543 6543 6543 6545 6547
		36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1	lisp code			 	 	 	 		 	 					6540 6543 6543 6543 6545 6547 6549
		36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2	lisp code			 	 	 · · · · · · · · · · · · · · · · · · ·	 	· · · · · · · · · · · · · · · · · · ·	 						6540 6543 6543 6543 6545 6547 6549 6550
		36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3	lisp code			 	 	 									6540 6543 6543 6543 6545 6547 6549 6550 6551
	36.3	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553
	36.3	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553
	36.3	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553
	36.3	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1 36.4.2	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553 6554
	36.3	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1 36.4.2 36.4.3	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553 6553 6554 6555
	36.3 36.4	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1 36.4.2 36.4.3 36.4.4	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553 6554 6555 6557
	36.3 36.4	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1 36.4.2 36.4.3 36.4.4 dtgex2	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553 6554 6555 6557 6559
	36.3 36.4	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1 36.4.2 36.4.3 36.4.4 dtgex2 36.5.1	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553 6554 6555 6557 6559 6559
	36.3 36.4	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1 36.4.2 36.4.3 36.4.4 dtgex2 36.5.1 36.5.2	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553 6554 6555 6557 6559 6560
	36.3 36.4	36.1.3 36.1.4 dgetc2 36.2.1 36.2.2 36.2.3 36.2.4 dlange 36.3.1 36.3.2 36.3.3 36.3.4 dlaqge 36.4.1 36.4.2 36.4.3 36.4.4 dtgex2 36.5.1 36.5.2 36.5.3	lisp code														6540 6543 6543 6545 6547 6549 6550 6551 6553 6553 6554 6555 6557 6559 6560 6562

		- General Matri	,		•		,					5599
37.1												
		Axiom unit tests										
	37.1.2	Axiom help page					 	 				 6599
		for tran code										
	37.1.4	lisp code					 	 				6602
37.2												
		Axiom unit tests										
		Axiom help page										
		for tran code										
	37.2.4	lisp code					 	 				6609
37.3	slange						 	 				6611
	37.3.1	Axiom unit tests					 	 				6611
	37.3.2	Axiom help page					 	 				6612
	37.3.3	for tran code					 	 				6613
	37.3.4	lisp code					 	 				6615
37.4	slaqge						 	 				6618
	37.4.1	Axiom unit tests					 	 				6618
	37.4.2	Axiom help page					 	 				6618
	37.4.3	fortran code					 	 				 6620
	37.4.4	lisp code					 	 				 6622
37.5	stgex2						 	 				 6624
	37.5.1	Axiom unit tests					 	 				6624
	37.5.2	Axiom help page					 	 				 6624
	37.5.3	fortran code					 	 				6627
	37.5.4	lisp code					 	 				6636
		- General Matri										
38.1	_											
		Axiom unit tests										
		Axiom help page										
		fortran code										
		lisp code										
38.2												
		Axiom unit tests										
		Axiom help page										
		fortran code										
		lisp code										
38.3												
	38.3.1	Axiom unit tests					 	 				6671
		Axiom help page										
		for tran code										
		lisp code										
38.4	10											
		Axiom unit tests										
	38.4.2	Axiom help page					 	 				 6679

		38.4.3	fortran code														 . 6	6681
		38.4.4	lisp code													 	 . 6	683
3	8.5																	
		38.5.1	Axiom unit tests													 	 . 6	685
			Axiom help page															
			fortran code															
			lisp code															
30 T	. A T	ACK	- General Matri	cos	^		z : 111	art	, P	out	inos		om	nlo	v16		66	07
			· · · · · · · · · · · · · · · ·															
9	9.1		Axiom unit tests															
			Axiom tunt tests Axiom help page															
			fortran code															
			lisp code															
9	0.2																	
3	9.2	_	Axiom unit tests															
			Axiom help page															
			fortran code															
0			lisp code															
3	9.3	_																
			Axiom unit tests															
			Axiom help page															
			fortran code															
			lisp code															
3	9.4																	
			Axiom unit tests															
			Axiom help page															
			fortran code															
			lisp code															
3	9.5	_																
		39.5.1	Axiom unit tests														 . 6	5720
		39.5.2	Axiom help page														 . 6	5720
		39.5.3	for tran code														 . 6	5722
		39.5.4	lisp code														 . 6	5726
40 L	ΔAP	ACK	- General Band	Ma	atr	ix.	Li	nea	r S	olv	e. D	oul	ble				67	33
		0	Axiom unit tests															
			Axiom help page															
			fortran code															5735
			lisp code															
1	0.2																	
4	0.4	_	Axiom unit tests															
			Axiom help page															5739
			fortran code														_	
			lisp code		•											 •		3749
		TU. 4.4	HOLL CHILE														. 0	$\cdot \cdot \cdot + \cdot \cdot 1$

CONTENTS	283
----------	-----

	40.3	_	x							
			Axiom unit tests .							
			Axiom help page [?]							
			fortran code							
		40.3.4	lisp code						 	. 6773
41	LAF	PACK	- General Band M	atrix, i	Linear	Solve,	Real			6783
									 	. 6783
		_	Axiom unit tests .							
			Axiom help page .							
			fortran code							
			lisp code							
	41.2									
		_	Axiom unit tests .							
			Axiom help page .							
			fortran code							
			lisp code							
	<i>1</i> 1 3		X							
	41.0		Axiom unit tests .							
			Axiom tunit tests : Axiom help page [?]							
			fortran code							
			lisp code							
		41.3.4	nsp code						 • •	. 0023
40										
42	LAH	PACK	- General Band M	atrix.	Linear	Solve.	Comple	e x		6833
42			- General Band M			-	_		 	6833 . 6833
42		cgbsv								. 6833
42		cgbsv 42.1.1	Axiom unit tests .						 	. 6833 . 6833
42		cgbsv 42.1.1 42.1.2	Axiom unit tests . Axiom help page .						 	. 6833 . 6833 . 6833
42		cgbsv 42.1.1 42.1.2 42.1.3	Axiom unit tests . Axiom help page . fortran code						 	. 6833 . 6833 . 6833 . 6835
42	42.1	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4	Axiom unit tests . Axiom help page . fortran code lisp code						 	. 6833 . 6833 . 6833 . 6835 . 6837
42	42.1	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx	Axiom unit tests . Axiom help page . fortran code lisp code						 	. 6833 . 6833 . 6833 . 6835 . 6837
42	42.1	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests .						 	. 6833 . 6833 . 6833 . 6835 . 6837 . 6838
42	42.1	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom unit tests . Axiom help page .							. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838
42	42.1	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code						· · · · · · · · · · · · · · · · · · ·	. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839
42	42.1 42.2	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code						· · · · · · · · · · · · · · · · · · ·	. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844
42	42.1 42.2	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code							. 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849
42	42.1 42.2	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom help page . fortran code Axiom unit tests .							. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859
42	42.1 42.2	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom unit tests . Axiom unit tests .							. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859
42	42.1 42.2	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom help page . Axiom unit tests . Axiom unit tests . Axiom help page . fortran code							. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859
42	42.1 42.2	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom unit tests . Axiom unit tests .							. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859
	42.1 42.2 42.3	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3 42.3.4	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom help page . Axiom unit tests . Axiom unit tests . Axiom help page . fortran code							. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859
	42.1 42.2 42.3	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3 42.3.4	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom help page . fortran code Axiom unit tests . Axiom unit tests . Axiom help page . fortran code lisp code			Solve,	Comple			. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859 . 6860 . 6868 . 6873
	42.1 42.2 42.3	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3 42.3.4 PACK zgbsv	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code Axiom help page . fortran code Axiom unit tests . Axiom help page . fortran code Axiom unit tests . Axiom help page . fortran code			Solve,	Comple	ex16		. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859 . 6860 . 6868 . 6873
	42.1 42.2 42.3	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3 42.3.4 PACK zgbsv 43.1.1	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom help page . fortran code Axiom unit tests . Axiom unit tests . Axiom help page . fortran code Capacitation of the contract of the contr			Solve	Comple			. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859 . 6860 . 6868 . 6873
	42.1 42.2 42.3	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3 42.3.4 PACK zgbsv 43.1.1	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code Axiom help page . fortran code X Axiom unit tests . Axiom help page . fortran code Axiom help page . Axiom help page . fortran code Axiom help page . fortran code Axiom help page . Axiom help page . fortran code Axiom unit tests .			Solve,	Comple	ex16		. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859 . 6860 . 6868 . 6873
	42.1 42.2 42.3	cgbsv 42.1.1 42.1.2 42.1.3 42.1.4 cgbsvx 42.2.1 42.2.2 42.2.3 42.2.4 cgbsvx 42.3.1 42.3.2 42.3.3 42.3.4 PACK zgbsv 43.1.1 43.1.2 43.1.3	Axiom unit tests . Axiom help page . fortran code lisp code Axiom unit tests . Axiom help page . fortran code lisp code Axiom help page . fortran code Axiom unit tests . Axiom help page . fortran code Axiom help page . fortran code Axiom help page . Axiom unit tests . Axiom unit tests . Axiom help page .	atrix,		Solve,	Comple	ex16		. 6833 . 6833 . 6833 . 6835 . 6837 . 6838 . 6838 . 6839 . 6844 . 6849 . 6859 . 6859 . 6860 . 6868 . 6873

43.2	zgbsvx	. 6888
	43.2.1 Axiom unit tests	. 6888
	43.2.2 Axiom help page	. 6889
	43.2.3 fortran code	. 6894
	43.2.4 lisp code	. 6899
43.3	zgbsvxx	
	43.3.1 Axiom unit tests	
	43.3.2 Axiom help page [?]	
	43.3.3 fortran code	
	43.3.4 lisp code	
44 LAI	PACK - General Band Matrix, Comp. Routines, Double	6933
44.1	dgbbrd	. 6933
	44.1.1 Axiom unit tests	. 6933
	44.1.2 Axiom help page	. 6933
	44.1.3 fortran code	. 6936
	44.1.4 lisp code	. 6943
44.2	dgbcon	
	44.2.1 Axiom unit tests	
	44.2.2 Axiom help page	
	44.2.3 fortran code	
	44.2.4 lisp code	
44.3	dgbequ	
	44.3.1 Axiom unit tests	
	44.3.2 Axiom help page	
	44.3.3 fortran code	
	44.3.4 lisp code	
44.4	dgbequb	
	44.4.1 Axiom unit tests	
	44.4.2 Axiom help page	
	44.4.3 fortran code	
	44.4.4 lisp code	
44 5	dgbrfs	
11.0	44.5.1 Axiom unit tests	
	44.5.2 Axiom help page	
	44.5.3 fortran code	
	44.5.4 lisp code	
44.6	dgbrfsx	
44.0	44.6.1 Axiom unit tests	
	44.6.2 Axiom help page [?]	
	44.6.2 Axioni neip page [1]	
44.7	44.6.4 lisp code	
44.7	dgbtf2	
	44.7.1 Axiom unit tests	
	44.7.2 Axiom help page	
	44.7.3 fortran code	. 7017

CONTENTS	285
----------	-----

44.7.4 lisp code
44.8 dgbtrf
44.8.1 Axiom unit tests
44.8.2 Axiom help page
44.8.3 fortran code
44.8.4 lisp code
44.9 dgbtrs
44.9.1 Axiom unit tests
44.9.2 Axiom help page
44.9.3 fortran code
44.9.4 lisp code
44.10dggbak
44.10.1 Axiom unit tests
44.10.2 Axiom help page
44.10.2 Axioni neip page
44.10.4 lisp code
44.11dggbal
44.11.1 Axiom unit tests
44.11.2 Axiom help page
44.11.3 fortran code
44.11.4 lisp code
44.12dla_gbamv
44.12.1 Axiom unit tests
44.12.2 Axiom help page
44.12.3 fortran code
44.12.4 lisp code
44.13dla_gbrcond
44.13.1 Axiom unit tests
44.13.2 Axiom help page
44.13.3 fortran code
44.13.4 lisp code
44.14dla_gbrfsx_extended
44.14.1 Axiom unit tests
44.14.2 Axiom help page [?]
44.14.3 fortran code
44.14.4 lisp code
44.15dla_gbrpvgrw
44.15.1 Axiom unit tests
44.15.2 Axiom help page
44.15.3 fortran code
44.15.4 lisp code
44.16dorgbr
44.16.1 Axiom unit tests
44.16.1 Axiom tulit tests
44.10.2 Axioni neip page
44.16.4 lisp code
44.10.4 IISD COUC

				Real	
45.1	sgbbrd		 	 	. 7147
	45.1.2	Axiom help page	 	 	. 7147
	45.1.3	fortran code	 	 	. 7150
	45.1.4	lisp code	 	 	. 7157
45.2	sgbcon		 	 	. 7170
	45.2.1	Axiom unit tests	 	 	. 7170
	45.2.2	Axiom help page	 	 	. 7170
45.3		*			
45.4		-			
10.1					
45.5					
10.0	_				
45.6		-			
10.0	_				
45.7		-			
40.1	_				
45.0		-			
45.6	_				
45.0		-			
45.9	sgbtrs				
	45.9.4	lisp code	 	 	. 7262

45.10sggbak	7266
45.10.1 Axiom unit tests	
45.10.2 Axiom help page	
45.10.3 fortran code	
45.10.4 lisp code	
45.11sggbal	
45.11.1 Axiom unit tests	
45.11.2 Axiom help page	
45.11.3 fortran code	
45.11.4 lisp code	
45.12sla_gbamv	
45.12.1 Axiom unit tests	
45.12.2 Axiom help page	
45.12.2 Axioni neip page	
45.12.4 lisp code	
45.13sla_gbrcond	
45.13.1 Axiom unit tests	
45.13.2 Axiom help page	
45.13.4 lisp code	
45.14sla_gbrfsx_extended	
45.14.1 Axiom unit tests	
45.14.2 Axiom help page [?]	
45.14.3 fortran code	
45.14.4 lisp code	
45.15sla_gbrpvgrw	
45.15.1 Axiom unit tests	
45.15.2 Axiom help page	
45.15.3 fortran code	
45.15.4 lisp code	
45.16sorgbr	
45.16.1 Axiom unit tests	
45.16.2 Axiom help page	
45.16.3 fortran code	
45.16.4 lisp code	7359
46 LAPACK - General Band Matrix, Comp. Routines, Complex	7365
46.1 cgbbrd	
46.1.1 Axiom unit tests	
46.1.2 Axiom help page	(505
40.1.3 IOI HAII COOP	
	7368
46.1.4 lisp code	7368 7375
46.1.4 lisp code	7368 7375 7375
46.1.4 lisp code	7368 7375 7375 7375

46.2.4 lisp code	381
46.3 cgbequ	386
46.3.1 Axiom unit tests	386
46.3.2 Axiom help page	386
46.3.3 fortran code	388
46.3.4 lisp code	391
46.4 cgbequb	395
46.4.1 Axiom unit tests	395
46.4.2 Axiom help page	396
46.4.3 fortran code	398
46.4.4 lisp code	401
46.5 cgbrfs	406
46.5.1 Axiom unit tests	406
46.5.2 Axiom help page	406
46.5.3 fortran code	409
46.5.4 lisp code	414
46.6 cgbrfsx	422
<u> </u>	422
46.6.2 Axiom help page	422
	429
	435
•	435
	435
	436
	438
	440
	443
	443
	444
	445
	452
	465
The state of the s	465
	465
	467
46.9.4 lisp code	
46.10cggbak	
	475
	476
rro	477
	480
	486
- 100 - 1	486
	486
1 1 0	488 488
	488 406

CONTENTS	289

46.12cla_gbamv	7519
46.12.1 Axiom unit tests	
46.12.2 Axiom help page	
46.12.3 fortran code	
46.12.4 lisp code	
46.13cla_gbrcond_c	
46.13.1 Axiom unit tests	
46.13.2 Axiom help page	
46.13.3 fortran code	
46.13.4 lisp code	
46.14cla_gbrcond_x	
46.14.1 Axiom unit tests	
46.14.2 Axiom help page	7539
46.14.3 fortran code	
46.14.4 lisp code	7544
46.15cla_gbrfsx_extended	
46.15.1 Axiom unit tests	
46.15.2 Axiom help page [?]	7550
46.15.3 fortran code	
46.15.4 lisp code	
46.16cla_gbrpvgrw	
46.16.1 Axiom unit tests	
46.16.2 Axiom help page	7570
46.16.3 fortran code	7571
46.16.4 lisp code	7573
46.17cungbr	7574
46.17.1 Axiom unit tests	7574
46.17.2 Axiom help page	7575
46.17.3 fortran code	7577
46.17.4 lisp code	7580
AWIADACK CO. ID. IMAA' C. D. A' C. I.	10 ====================================
47 LAPACK - General Band Matrix, Comp. Routines, Complex 47.1 zgbbrd	
47.1.1 Axiom unit tests	
47.1.1 Axiom unit tests	
47.1.2 Axioni neip page	
47.1.4 lisp code	
47.1.4 hsp code	
47.2.1 Axiom unit tests	
47.2.2 Axiom help page	
47.2.2 Axioni neip page	
47.2.4 lisp code	
47.3 zgbequ	
47.3.1 Axiom unit tests	
47.3.2 Axiom help page	
47.3.2 Axiom help page	
41.9.9 10101an code	1024

	47.3.4 lisp code	 . 7628
47.4	zgbequb	 . 7632
	47.4.1 Axiom unit tests	 . 7632
	47.4.2 Axiom help page	 . 7632
	47.4.3 fortran code	
	47.4.4 lisp code	 . 7638
47.5	zgbrfs	 . 7642
	47.5.1 Axiom unit tests	
	47.5.2 Axiom help page	 . 7643
	47.5.3 fortran code	
	47.5.4 lisp code	 . 7650
47.6	zgbrfsx	
	47.6.1 Axiom unit tests	
	47.6.2 Axiom help page [?]	
	47.6.3 fortran code	
	47.6.4 lisp code	
47.7	$\operatorname{zgbtf2}$	
	47.7.1 Axiom unit tests	
	47.7.2 Axiom help page	
	47.7.3 fortran code	
	47.7.4 lisp code	
47.8	zgbtrf	
11.0	47.8.1 Axiom unit tests	
	47.8.2 Axiom help page	
	47.8.3 fortran code	
	47.8.4 lisp code	
47.9	zgbtrs	
41.0	47.9.1 Axiom unit tests	
	47.9.2 Axiom help page	
	47.9.3 fortran code	
	47.9.4 lisp code	
47.10	zggbak	
41.10	$47.10.1 \text{Axiom unit tests} \dots \dots \dots \dots \dots \dots \dots \dots \dots $	
	47.10.1 Axiom tulit tests	
	47.10.2 Axiom help page	
	47.10.3 lot trail code	
47 11		
47.11	zggbal	
	47.11.2 Axiom help page	
	47.11.3 fortran code	
47 10	47.11.4 lisp code	
4(.12	zla_gbamv	
	47.12.1 Axiom unit tests	
	47.12.2 Axiom help page	
	47.12.3 fortran code	 . 7751
	4. (1. (4. (1. (1. (1. (1. (1. ((///

CONTENTS	291
----------	-----

47.13 zla_gbrcond_c	7763
47.13.1 Axiom unit tests	
47.13.2 Axiom help page	
47.13.3 fortran code	
47.13.4 lisp code	
47.14zla_gbrcond_x	
47.14.1 Axiom unit tests	
47.14.2 Axiom help page	
47.14.3 fortran code	
47.14.4 lisp code	
47.15zla_gbrfsx_extended	
47.15.1 Axiom unit tests	
47.15.2 Axiom help page [?]	
47.15.3 fortran code	
47.15.4 lisp code	
47.16zla_gbrpvgrw	
47.16.1 Axiom unit tests	
47.16.2 Axiom help page	
47.16.3 fortran code	
47.16.4 lisp code	
47.17zungbr	
47.17.1 Axiom unit tests	
47.17.2 Axiom help page	
47.17.3 fortran code	
47.17.4 lisp code	7817
48 LAPACK - General Band Matrix, Auxilliary Routines, Double	7823
48.1 dlangb	7823
48.1.1 Axiom unit tests	7823
48.1.2 Axiom help page	
48.1.3 fortran code	
48.1.4 lisp code	
48.2 dlaggb	
48.2.1 Axiom unit tests	
48.2.2 Axiom help page	
48.2.3 fortran code	
48.2.4 lisp code	
101 2 11 110p 0040 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
49 LAPACK - General Band Matrix, Auxilliary Routines, Real	7839
49.1 slangb	
49.1.1 Axiom unit tests	
49.1.2 Axiom help page	7839
49.1.3 fortran code	7841
49.1.4 lisp code	7843
49.2 slaqgb	7847
49.2.1 Axiom unit tests	79.47

		49.2.2	Axiom help pag	ge				•				•				•							•		 •	7847
		49.2.3	fortran code .																							7849
		49.2.4	lisp code																							7851
50			- General Bar										-								_					
	50.1	0																								
		50.1.1	Axiom unit tes	ts																						7855
		50.1.2	Axiom help pag	ge																						7855
		50.1.3	fortran code .																							7857
		50.1.4	lisp code																							7859
	50.2	claqgb																								7863
		50.2.1	Axiom unit tes	ts																						7863
		50.2.2	Axiom help pag	gе																						7864
			fortran code.	-																						
			lisp code																							
			1																							
51	LAF	PACK	- General Bar	\mathbf{d}	\mathbf{M}	\mathbf{a}	tri	ix,	A	۱u	xil	lia	ary	R	loi	uti	ne	es,	\mathbf{C}_{0}	om	ıpl	$\mathbf{e}\mathbf{x}$	16		7	871
	51.1	zlangb																								7871
		51.1.1	Axiom unit tes	ts																						7871
		51.1.2	Axiom help pag	gе																						7871
		51.1.3	fortran code .																							7873
		51.1.4	lisp code																							7875
	51.2	zlaqgb																								7879
			Axiom unit tes																							
			Axiom help pag																							
			fortran code.	_																						
			lisp code																							
		01.2.1	nop code		•	•		•		•		·		•			•		·		·		•	•	 •	
52	LAF	PACK	- Symmetric I	ΛĮε	atr	ix	ι, .	Li	ne	ar	\cdot S	ol	ve.	, Γ	01	ub	le								7	887
	52.1	dsysv.																								7887
		52.1.1	Axiom unit tes	ts																						7887
		52.1.2	Axiom help pag	gе																						7887
			fortran code.																							
			lisp code																							
	52.2		rook																							
	·		Axiom unit tes																							
			Axiom help pag																							
			fortran code .																							
			lisp code																							7899
	52.2																									7901
	⊍⊿.3		Axiom unit tes																							7901
			Axiom unit tes Axiom help pa																							
			fortran code .	_																						
			lisp code	•	•	•		•	•	•		•		•		•	•		•		•		•	•	 •	7008

53	LAF		7913
	53.1	ssysv	
		53.1.1 Axiom unit tests	. 7913
		53.1.2 Axiom help page	. 7913
		53.1.3 fortran code	. 7916
		53.1.4 lisp code	
	53.2	ssysv_rook	
		53.2.1 Axiom unit tests	
		53.2.2 Axiom help page	
		53.2.3 fortran code	
		53.2.4 lisp code	
	53.3	SSySVX	
		53.3.1 Axiom unit tests	
		53.3.2 Axiom help page	
		53.3.3 fortran code	
		53.3.4 lisp code	
		1	
54	LAF	PACK - Symmetric Matrix, Linear Solve, Complex	7939
	54.1	csysv	. 7939
		54.1.1 Axiom unit tests	. 7939
		54.1.2 Axiom help page	. 7939
		54.1.3 fortran code	. 7942
		54.1.4 lisp code	. 7944
	54.2	${\it csysv_rook} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$. 7946
		54.2.1 Axiom unit tests	. 7946
		54.2.2 Axiom help page	. 7947
		54.2.3 fortran code	. 7949
		54.2.4 lisp code	. 7951
	54.3	$csysvx \ \dots $. 7953
		54.3.1 Axiom unit tests	. 7953
		54.3.2 Axiom help page	. 7954
		54.3.3 fortran code	. 7958
		54.3.4 lisp code	. 7960
	54.4	$csysvxx \dots \dots$. 7964
		54.4.1 Axiom unit tests	. 7964
		54.4.2 Axiom help page	. 7965
		54.4.3 fortran code	. 7972
		54.4.4 lisp code	. 7976
55		PACK - Symmetric Matrix, Linear Solve, Complex16	7983
	55.1	ZSYSV	
		55.1.1 Axiom unit tests	
		55.1.2 Axiom help page	
		55.1.3 fortran code	
	EE O	55.1.4 lisp code	
	55.2	zsysv_rook	. 7990

		55.2.1	Axiom unit te	sts																					7990
		55.2.2	Axiom help pa	age																					7991
		55.2.3	fortran code.																						7993
		55.2.4	lisp code																						7995
	55.3																								
			Axiom unit te																						
			Axiom help pa																						
			fortran code.																						
			lisp code																						
	55.4		x																						
	00.1		Axiom unit te																						
			Axiom help pa																						
			fortran code .																						
			lisp code																						
		55.4.4	nsp code	٠.	•	• •	•	•		•	•		•		•		•	 •	•	• •	•	 •	•	•	0020
56	LAF	PACK	- Symmetric	Ma	tr	ix.	F	Cie	rer	ıva	alı	1e.	Т)ດາ	ıbl	e								8	027
00																									
	00.1		Axiom unit te																						
			Axiom help pa																						
			fortran code .																						
			lisp code																						
	56.2																								
	50.2		Axiom unit te																						
			Axiom help pa																						
			fortran code.	_																					
			lisp code																						
	EG 2																								
	50.5																								
			Axiom unit te																						
			Axiom help pa	_																					
			fortran code.																						
	- 0 1		lisp code																						
	56.4																								
			Axiom unit te																						
			Axiom help pa	_																					
			fortran code .																						
			lisp code																						
	56.5																								
		56.5.1	Axiom unit te	sts				•									•						٠	•	8088
			Axiom help pa																						
			fortran code .																						
			lisp code																					-	8094
	56.6		l																						8097
		56.6.1	Axiom unit te	sts																					8097
		56.6.2	Axiom help pa	age																					8098
			for tran code .																						8101
		56.6.4	lien codo																						Q10 /

CONTENTS	295

	56.7	dsygvx				 					 				. 8	3108
		56.7.1	Axiom unit tes	ts		 					 				. 8	8108
		56.7.2	Axiom help pa	ge		 									. 8	3108
		56.7.3	for tran code .			 									. 8	3112
		56.7.4	lisp code			 									. 8	3115
57			- Symmetric			_		-								21
	57.1	ssyev .				 									. 8	3121
		57.1.1	Axiom unit tes	$^{\mathrm{ts}}$. 8	3121
		57.1.2	Axiom help pa	ge		 					 				. 8	3121
		57.1.3	for tran code .			 									. 8	8123
		57.1.4	lisp code			 					 				. 8	8126
	57.2	ssyevd				 					 				. 8	8130
		57.2.1	Axiom unit tes	$^{\mathrm{ts}}$. 8	8130
		57.2.2	Axiom help pa	ge		 					 				. 8	3131
			fortran code.	_												
			lisp code													
	57.3															
			Axiom unit tes													
			Axiom help pa													
			fortran code.													
			lisp code													
	57 4															
	01.1		Axiom unit tes													
			Axiom help pa													
			fortran code .	_												
			lisp code													
	57 5															
	51.5		Axiom unit tes													
			Axiom unit tes Axiom help pa													
				_												
			fortran code .													
	57 C		lisp code													
	0.16		l													
			Axiom unit tes													
			Axiom help pa	_												
			fortran code .													
			lisp code													
	57.7															
			Axiom unit tes													
			Axiom help pa	_												
			fortran code .													
		57.7.4	lisp code			 			 		 				. 8	3208

58 LAF	PACK - Symmetric Matrix, Comp	p. Routines, Double	$\bf 8215$
58.1	dla_syamv		. 8215
	58.1.1 Axiom unit tests		. 8215
	58.1.2 Axiom help page		. 8215
	58.1.4 lisp code		. 8222
58.2	dla_syrcond		. 8230
	58.2.2 Axiom help page		8230
58.3			
00.0			
58.4			
90.4			
E0 E	-		
56.5	v		
F O. C			
58.6	v		
58.7			
58.8			
	58.8.4 lisp code		8353
58.9	$dsyconv \dots \dots \dots \dots \dots \dots$. 8356
	58.9.1 Axiom unit tests		8356
	58.9.2 Axiom help page		8356
	58.9.3 fortran code		8357
	58.9.4 lisp code		8362

CONTENTS	297

NTENTS	297
58.10dsyequb	8369
58.10.1 Axiom unit tests	
58.10.2 Axiom help page	
58.10.3 fortran code	
58.10.4 lisp code	
58.11dsygs2	
58.11.1 Axiom unit tests	
58.11.2 Axiom help page	
58.11.3 fortran code	
58.11.4 lisp code	
58.12dsygst	
58.12.1 Axiom unit tests	
58.12.2 Axiom help page	
58.12.3 fortran code	
58.12.4 lisp code	
58.13dsyrfs	
58.13.1 Axiom unit tests	
58.13.2 Axiom help page	
58.13.3 fortran code	
58.13.4 lisp code	
88.14dsyrfsx	
58.14.1 Axiom unit tests	
58.14.2 Axiom help page [?]	
58.14.3 fortran code	
58.14.4 lisp code	
68.15dsytd2	
58.15.1 Axiom unit tests	
58.15.2 Axiom help page	
58.15.3 fortran code	
58.15.4 lisp code	
8.16dsytf2	
58.16.1 Axiom unit tests	
58.16.2 Axiom help page	
58.16.3 fortran code	
58.16.4 lisp code	
·	
58.17.1 Axiom unit tests	
58.17.2 Axiom help page	
58.17.3 fortran code	
58.17.4 lisp code	
8.18dsytrd	
58.18.1 Axiom unit tests	
58.18.2 Axiom help page	
58.18.3 fortran code	
58.18.4 lisp code	
58.19dsytrf	8503

58.19.1 Axiom unit tests											 			8503
58.19.2 Axiom help page														
$58.19.3 \text{fortran code} \dots$														
$58.19.4 \operatorname{lisp\ code}$														
$58.20 dsytrf_{rook} \dots \dots$														
58.20.1 Axiom unit tests														
$58.20.2\mathrm{Axiom}$ help page														
$58.20.3 \text{fortran code} \dots$														
$58.20.4 \operatorname{lisp\ code}$														
58.21dsytri														
58.21.1 Axiom unit tests														
$58.21.2\mathrm{Axiom}$ help page														
$58.21.3 \text{fortran code} \dots$														
$58.21.4 \operatorname{lisp\ code}$														
58.22dsytri2														
58.22.1 Axiom unit tests														
$58.22.2\mathrm{Axiom}$ help page														
$58.22.3 \text{fortran code} \dots$														8542
$58.22.4 \operatorname{lisp\ code}$														
58.23 dsytri $2x \dots \dots \dots$											 			8546
58.23.1 Axiom unit tests											 			8546
58.23.2 Axiom help page														
$58.23.3 \text{fortran code} \dots$											 			8547
$58.23.4 \operatorname{lisp\ code}$											 			8556
58.24 dsytri_rook														8576
58.24.1 Axiom unit tests											 			8576
58.24.2 Axiom help page											 			8576
$58.24.3 \text{fortran code} \dots$											 			8578
$58.24.4 \operatorname{lisp\ code}$											 			8584
$58.25 dsytrs \dots \dots$											 			8596
58.25.1 Axiom unit tests											 			8596
58.25.2 Axiom help page											 			8596
$58.25.3 \text{fortran code} \dots$											 			8597
58.25.4 lisp code											 			8604
58.26dsytrs2											 			8614
58.26.1 Axiom unit tests											 			8614
58.26.2 Axiom help page											 			8614
$58.26.3 \text{fortran code} \dots$											 			8616
$58.26.4 \operatorname{lisp\ code}$											 			8620
58.27dsytrs_rook											 			8628
58.27.1 Axiom unit tests											 			8628
58.27.2 Axiom help page											 			8629
$58.27.3 \text{fortran code} \dots$														8630
$58.27.4 \operatorname{lisp\ code}$														8637
58.28dtgsyl														8649
58 28 1 Axiom unit tosts														8640

CONTENTS	299
ONIENIS	299

		58.28.2	Axiom hel	lp page		 		 	 						8649
		58.28.3	fortran co	de		 		 	 	 					8653
		58.28.4	lisp code.			 		 	 	 					8660
	58.29	9dtrsyl				 		 	 						8678
		58.29.1	Axiom un	it tests		 		 	 	 					8678
		58.29.2	Axiom hel	lp page		 		 	 	 					8678
		58.29.3	fortran co	de		 		 	 	 					8680
		58.29.4	lisp code.			 		 	 						8696
59			- Symmet											_	3747
	59.1		mv												
			Axiom un												
			Axiom hel												
			fortran co												
			lisp code.												
	59.2	sla_syr	$cond \dots$			 		 	 						8761
		59.2.1	Axiom un	it tests		 		 	 	 					8761
		59.2.2	Axiom hel	lp page		 		 	 						8762
		59.2.3	fortran co	de		 		 	 	 					8764
		59.2.4	lisp code.			 		 	 	 					8767
	59.3	sla_syr	$fsx_extende$	ed		 		 	 	 					8774
		59.3.1	Axiom un	it tests		 		 	 	 					8774
		59.3.2	Axiom hel	lp page	[?]			 	 	 					8774
			fortran co												
			lisp code.												
	59.4		pvgrw												
	00.1		Axiom un												
			Axiom hel												
			fortran co												
			lisp code.												
	50 5														
	59.5		Axiom un												
			Axiom hel												
			fortran co												
	TO 6		lisp code .												
	59.0		rook												
			Axiom un												
			Axiom hel												
			fortran co												
			lisp code.												
	59.7														
			Axiom un												
			Axiom hel												
			fortran co												
			lisp code.												
	59.8	ssycon	_rook			 		 	 						8881

59.8.1 Axiom unit tests
59.8.2 Axiom help page
59.8.3 fortran code
59.8.4 lisp code
59.9 ssyconv
59.9.1 Axiom unit tests
59.9.2 Axiom help page
59.9.3 fortran code
59.9.4 lisp code
59.10ssyequb
59.10.1 Axiom unit tests
59.10.2 Axiom help page
59.10.3 fortran code
59.10.4 lisp code
59.11ssygs2
59.11.1 Axiom unit tests
59.11.2 Axiom help page
59.11.3 fortran code
59.11.4 lisp code
59.12ssygst
59.12.1 Axiom unit tests
59.12.2 Axiom help page
59.12.3 fortran code
59.12.4 lisp code
59.13ssyrfs
59.13.1 Axiom unit tests
59.13.2 Axiom help page
59.13.3 fortran code
59.13.4 lisp code
59.14ssyrfsx
59.14.1 Axiom unit tests
59.14.2 Axiom help page [?]
59.14.3 fortran code
59.14.4 lisp code
59.15ssytd2
59.15.1 Axiom unit tests
59.15.2 Axiom help page
59.15.3 fortran code
59.15.4 lisp code
59.16ssytf2
59.16.1 Axiom unit tests
59.16.2 Axiom help page
59.16.3 fortran code
59.16.4 lisp code
59.17ssytf2_rook
50 17 1 Axiom unit tosts

CONTENTS	301
CONTENTS	301

59.17.2 Axiom help page	9004
$59.17.3 \mathrm{fortran} \mathrm{code} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots $	9006
$59.17.4 \operatorname{lisp\ code}$	9018
59.18ssytrd	9031
59.18.1 Axiom unit tests	9031
59.18.2 Axiom help page	9031
59.18.3 fortran code	9034
59.18.4 lisp code	9038
59.19ssytrf	9042
59.19.1 Axiom unit tests	9042
59.19.2 Axiom help page	9043
59.19.3 fortran code	
59.19.4 lisp code	9049
59.20ssytrf_rook	
59.20.1 Axiom unit tests	
59.20.2 Axiom help page	9053
59.20.3 fortran code	
59.20.4 lisp code	
59.21ssytri	
59.21.1 Axiom unit tests	
59.21.2 Axiom help page	
59.21.3 fortran code	
59.21.4 lisp code	
59.22ssytri2	
59.22.1 Axiom unit tests	
59.22.2 Axiom help page	
59.22.3 fortran code	
59.22.4 lisp code	
59.23ssytri2x	
59.23.1 Axiom unit tests	
59.23.2 Axiom help page	
59.23.3 fortran code	
59.23.4 lisp code	
59.24ssytri_rook	
59.24.1 Axiom unit tests	
59.24.2 Axiom help page	
59.24.4 lim and a	
59.24.4 lisp code	
v	
59.25.1 Axiom unit tests	
59.25.2 Axiom help page	
59.25.3 fortran code	
59.25.4 lisp code	
59.26ssytrs2	
59.26.1 Axiom unit tests	
59.26.2 Axiom help page	9153

		59.26.3	3 fortran code							 					9155
		59.26.4	llisp code							 					9159
	59.27	ssytrs_	rook							 					9168
		59.27.1	Axiom unit t	ests						 					9168
			Axiom help												
			fortran code												
			llisp code												
	59.28														
			Axiom unit t												
			Axiom help												
			fortran code												
			llisp code												
	59.29														
			Axiom unit t												
			Axiom help												
			fortran code												
			llisp code												
60			- Symmetri												283
	60.1		mv												
			Axiom unit t												
			Axiom help 1												
			fortran code												
			lisp code												
	60.2		$cond_c \dots$												
		60.2.1	Axiom unit t	ests						 					9298
		60.2.2	Axiom help	page						 					9298
		60.2.3	fortran code							 					9300
		60.2.4	lisp code							 					9304
	60.3	cla_syr	$\operatorname{cond}_{-x} \dots$							 					9310
		60.3.1	Axiom unit t	ests						 					9310
		60.3.2	Axiom help	page						 					9310
		60.3.3	fortran code							 					9312
		60.3.4	lisp code							 					9315
	60.4	cla_syr	$fsx_{extended}$							 					9320
		60.4.1	Axiom unit t	ests						 					9320
		60.4.2	Axiom help	page	[?]					 					9320
		60.4.3	fortran code							 					9326
		60.4.4	lisp code							 					9332
	60.5	cla_syr	pvgrw							 					9340
		60.5.1	Axiom unit t	ests						 					9340
		60.5.2	Axiom help	page						 					9340
		60.5.3	fortran code							 					9342
		60.5.4	lisp code							 					9346
	60.6	${\it clasyf}$								 					9353
		60 6 1	Axiom unit t	ests											9353

CONTENTS	303
----------	-----

	60.6.2	Axiom help page						 						9353
	60.6.3	fortran code						 						9355
	60.6.4	lisp code						 						9368
60.7	clasyf_r	ook						 						9385
		Axiom unit tests												
		Axiom help page												
		fortran code												
		lisp code												
60.8														
00.0		Axiom unit tests												
		Axiom help page												
		fortran code												
		lisp code												
60 Q		rook												
00.3		Axiom unit tests												
		Axiom help page												
		fortran code												
CO 10		lisp code												
00.10														
		Axiom unit tests												
		Axiom help page												
		fortran code												
		lisp code												
60.11														
		Axiom unit tests												
		Axiom help page												
		fortran code												
		lisp code \dots												
60.12	2csyrfs							 						9466
	60.12.1	Axiom unit tests						 						9466
	60.12.2	Axiom help page						 						9466
	60.12.3	fortran code						 						9469
	60.12.4	$lisp code \dots \dots$						 						9473
60.13	3csyrfsx							 						9481
	60.13.1	Axiom unit tests						 						9481
	60.13.2	Axiom help page	?]					 						9482
		fortran code												
		lisp code												
60.14														9494
		Axiom unit tests												9494
		Axiom help page												9494
		fortran code												9496
		lisp code												9504
60 1!	5csytf2_{-r}	•												9515
50.16		Axiom unit tests												9515
		Axiom help page												
	00.10.4	TIME THOU		•				 						$\sigma \sigma \tau \sigma$

$60.15.3 \text{fortran code} \dots$													
60.15.4 lisp code													
60.16csytrf													
60.16.1 Axiom unit tests													
60.16.2 Axiom help page													
$60.16.3 \text{fortran code} \dots$													
60.16.4 lisp code													
$60.17 \text{csytrf_rook} \dots \dots$													
60.17.1 Axiom unit tests													
60.17.2 Axiom help page													
$60.17.3 \text{fortran code} \dots$													9557
$60.17.4 \operatorname{lisp\ code}$													9561
60.18csytri													9565
60.18.1 Axiom unit tests													9565
60.18.2 Axiom help page											 		9565
$60.18.3 \text{fortran code} \dots$											 		9567
60.18.4 lisp code													9572
60.19csytri2											 		9581
60.19.1 Axiom unit tests													9581
60.19.2 Axiom help page													9582
$60.19.3 \text{fortran code} \dots$													9583
$60.19.4 \operatorname{lisp\ code}$											 		9585
60.20 csytri $2x \dots \dots \dots$													9587
60.20.1 Axiom unit tests			 										9587
60.20.2 Axiom help page											 		9587
$60.20.3 \text{fortran code} \dots$													9589
60.20.4 lisp code													9598
60.21 csytri_rook													9617
60.21.1 Axiom unit tests													9617
60.21.2 Axiom help page													
$60.21.3 \text{fortran code} \dots$													9619
$60.21.4 \operatorname{lisp\ code}$													
60.22csytrs													
60.22.1 Axiom unit tests													
60.22.2 Axiom help page													
$60.22.3 \text{fortran code} \dots$													
$60.22.4 \operatorname{lisp\ code}$													9645
60.23 csytrs $2 \dots \dots \dots$													9656
60.23.1 Axiom unit tests													9656
60.23.2 Axiom help page													9656
60.23.3 fortran code													9658
$60.23.4 \operatorname{lisp\ code}$													9662
60.24 csytrs_rook													9670
60.24.1 Axiom unit tests													9670
60.24.2 Axiom help page													9671
60.24.3 fortran codo													0672

CONTENTS 305	
--------------	--

		60.24.4	lisp code			 		 	 			 		 			 9679
	60.2																
	00.2	- 0	Axiom ur														
			Axiom he														
			fortran co														
			lisp code														
	60.20		-														
	00.20																
			Axiom ur														
			Axiom he														
			fortran co														
		60.26.4	lisp code			 		 	 			 					 9726
			C			~		_			~						
61			- Symme														9737
	61.1		mv														
			Axiom ur														
			Axiom he														
			fortran co														
		61.1.4	lisp code			 		 	 			 		 			 9744
	61.2	zla_syr	$cond_c$.			 		 	 			 		 			 9752
		61.2.1	Axiom ur	nit tests		 		 	 			 		 			 9752
		61.2.2	Axiom he	elp page		 		 	 			 		 			 9752
			fortran co														
			lisp code														
	61.3		$\operatorname{cond}_{-\mathbf{x}}$.														
	01.0		Axiom ur														
			Axiom he														
			fortran co														
			lisp code														
	61 4		fsx_extend														
	01.4		Axiom ur														
			Axiom he														
			fortran co														
			lisp code														
	61.5		pvgrw .														
			Axiom ur														
			Axiom he														
			fortran co														
		61.5.4	lisp code			 		 	 			 		 			 9800
	61.6	zlasyf				 		 	 			 		 			 9807
		61.6.1	Axiom ur	nit tests		 		 	 			 		 			 9807
		61.6.2	Axiom he	elp page		 		 	 			 		 			 9808
		61.6.3	fortran co	ode		 		 	 			 		 			 9810
			lisp code														
	61.7		rook														
	•		Axiom ur														
			Axiom he														
		01.1.2	TAIOIII IIC	Th hase	•	 	•	 	 	•	• •	 	•	 •	•	•	 0020

61.7.3 fortran code						 												9825
61.7.4 lisp code																		
61.8 zsycon																		9839
61.8.1 Axiom unit tests																		9839
61.8.2 Axiom help page																		9839
61.8.3 fortran code																		9841
61.8.4 lisp code																		9843
61.9 zsycon_rook																		9845
61.9.1 Axiom unit tests																		9845
61.9.2 Axiom help page																		9846
61.9.3 fortran code																		9847
61.9.4 lisp code																		9850
$61.10zsyconv \dots \dots$																		9852
61.10.1 Axiom unit tests																		9852
61.10.2 Axiom help page						 												9852
61.10.3 fortran code						 												9854
$61.10.4 \operatorname{lisp\ code}$						 												9859
$61.11zsyequb \dots \dots$						 												9866
61.11.1 Axiom unit tests						 												9866
61.11.2 Axiom help page						 												9866
61.11.3 fortran code						 												9868
61.11.4 lisp code						 												9872
61.12zsyrfs						 												9881
61.12.1 Axiom unit tests						 												9881
61.12.2 Axiom help page						 												9881
$61.12.3\mathrm{fortran}$ code						 												9884
$61.12.4 \operatorname{lisp\ code}$						 												9889
61.13zsyrfsx						 												9897
61.13.1 Axiom unit tests						 												9897
61.13.2 Axiom help page	[?]					 												9897
61.13.3 fortran code						 										 		9903
$61.13.4 \operatorname{lisp\ code}$																		9909
61.14zsytf2						 										 		9909
61.14.1 Axiom unit tests						 										 		9909
61.14.2 Axiom help page																		9909
61.14.3 fortran code																		9912
$61.14.4 \operatorname{lisp\ code}$																		9920
61.15 zsytf2_rook																		9920
61.15.1 Axiom unit tests						 										 		9920
61.15.2 Axiom help page																		9920
61.15.3 fortran code																		9923
$61.15.4 \operatorname{lisp\ code}$																		9926
61.16zsytrf																		9926
61.16.1 Axiom unit tests																		9926
61.16.2 Axiom help page																		9927
61 16 3 fortran code	• •	•	•	• •	٠	 •	•	•	•	•	•	•	•	•	•	 •	•	0020

CONTENTS	307

$61.16.4 \text{ lisp code} \dots \dots$	
61.17zsytrf_rook	
61.17.1 Axiom unit tests	
61.17.2 Axiom help page	
61.17.3 fortran code	
61.17.4 lisp code	
61.18zsytri	
61.18.1 Axiom unit tests	
61.18.2 Axiom help page	
61.18.3 fortran code	
61.18.4 lisp code	
61.19zsytri2	
61.19.1 Axiom unit tests	
61.19.2 Axiom help page	
61.19.3 fortran code	
61.19.4 lisp code	
61.20zsytri2x	
61.20.1 Axiom unit tests	
61.20.2 Axiom help page	
61.20.3 fortran code	
61.20.4 lisp code	
61.21zsytri_rook	
61.21.1 Axiom unit tests	
61.21.2 Axiom help page	
61.21.3 fortran code	
61.21.4 lisp code	
61.22zsytrs	
61.22.1 Axiom unit tests	
61.22.2 Axiom help page	
61.22.3 fortran code	
61.22.4 lisp code	
61.23zsytrs2	
61.23.1 Axiom unit tests	
61.23.2 Axiom help page	9
61.23.3 fortran code	
61.23.4 lisp code	
61.24zsytrs_rook	
61.24.1 Axiom unit tests	
61.24.2 Axiom help page	
61.24.3 fortran code	5
61.24.4 lisp code	2
61.25ztgsyl	4
61.25.1 Axiom unit tests	4
61.25.2 Axiom help page	4
61.25.3 fortran code	8
61.25.4 lisp code	5
-	

	61.26	öztrsyl																					 	10101
		61.26.1	Axiom unit tests																				 	10101
		61.26.2	2 Axiom help page																				 	10101
		61.26.3	3 fortran code																				 	10103
			llisp code																					
			_																					
62			- Symmetric M																					
	62.1																							
		62.1.1	Axiom unit tests																				 	10121
		62.1.2	Axiom help page																				 	10121
		62.1.3	fortran code																				 	10123
		62.1.4	lisp code																				 	10125
	62.2	dlaqsy																					 	10130
		62.2.1	Axiom unit tests																				 	10130
		62.2.2	Axiom help page																				 	10130
		62.2.3	fortran code																				 	10132
			lisp code																					
	62.3																							
			Axiom unit tests																					
			Axiom help page																					
			fortran code																					
			lisp code																					
	62.4		apr																					
			Axiom unit tests																					
			Axiom help page																					
			fortran code																					
			lisp code																					
	62.5																							
	02.0	0.0	Axiom unit tests																					
			Axiom help page																					
			fortran code																					
			lisp code																					
		02.0.4	nsp code	•	•	•	•		٠		•	•	•	•	•		•	• •	•	 •	•	•	 	10107
63	LAF	PACK	- Symmetric M	at	ri	x.	Α	.113	cill	liai	rv	R	01	ıti	ne	s.	R	eal					10	0205
	00.1		Axiom unit tests																					
			Axiom help page																					
			fortran code																					
			lisp code																					
	63.2																							
	00.2	- 0	Axiom unit tests																					
			Axiom help page																					
			fortran code																					
			lisp code																					
	63.3																							
	00.0		Axiom unit tests																					
		05.5.1	AXIOHI UIII tests																				 	10219

CONTENTS	309

		63.3.2	Axiom help page				 											 10220
		63.3.3	for tran code				 											 10222
		63.3.4	lisp code				 											 10228
	63.4	ssyswa	pr				 											 10239
		63.4.1	Axiom unit tests				 											 10239
		63.4.2	Axiom help page				 											 10239
		63.4.3	for tran code				 											 10240
		63.4.4	lisp code				 											 10242
	63.5	stgsy2					 											 10242
		63.5.1	Axiom unit tests				 											 10242
		63.5.2	Axiom help page				 											 10243
		63.5.3	for tran code				 											 10246
		63.5.4	lisp code				 											 10261
								_	_				_					
64			- Symmetric Ma															0299
	64.1																	
			Axiom unit tests															
			Axiom help page															
			fortran code															
			lisp code															
	64.2																	
			Axiom unit tests															
			Axiom help page															
			fortran code															
			lisp code															
	64.3																	
			Axiom unit tests															
			Axiom help page															
			fortran code															
			lisp code															
	64.4																	
			Axiom unit tests															
			Axiom help page															
			fortran code															
	015		lisp code															
	64.5																	
			Axiom unit tests															
			Axiom help page															
			fortran code															
	010		lisp code															
	64.6		pr															
			Axiom unit tests															
			Axiom help page															
			fortran code															
	647	04.0.4	lisp code	• •	•	 ٠	 • •	•	٠	 •	 •	•		•	•	•	 •	 10342

	64.7.1	Axiom unit tests	. 10343
	64.7.2	Axiom help page	. 10343
	64.7.3	fortran code	. 10346
	64.7.4	lisp code	. 10351
		- Symmetric Matrix, Auxilliary Routines, Complex16	
65.1			
		Axiom unit tests	
		Axiom help page	
		fortran code	
	65.1.4	lisp code	. 10363
65.2	zlansy		. 10365
	65.2.1	Axiom unit tests	. 10365
	65.2.2	Axiom help page	. 10365
	65.2.3	fortran code	. 10367
	65.2.4	lisp code	. 10369
65.3	zlaqsy		. 10374
	65.3.1	Axiom unit tests	. 10374
	65.3.2	Axiom help page	. 10374
	65.3.3	$ fortran\ code\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\ .\$. 10376
	65.3.4	lisp code	. 10378
65.4	zsymv		. 10379
	65.4.1	Axiom unit tests	. 10379
	65.4.2	Axiom help page	. 10380
	65.4.3	fortran code	. 10382
	65.4.4	lisp code	. 10385
65.5	zsyr .		. 10391
	65.5.1	Axiom unit tests	. 10391
	65.5.2	Axiom help page	. 10391
	65.5.3	fortran code	. 10393
	65.5.4	lisp code	. 10395
65.6	zsyswa	pr	. 10399
	65.6.1	Axiom unit tests	. 10399
	65.6.2	Axiom help page	. 10399
	65.6.3	fortran code	. 10400
	65.6.4	lisp code	. 10402
65.7	ztgsy2		. 10402
	65.7.1	Axiom unit tests	. 10402
	65.7.2	Axiom help page	. 10403
	65.7.3	fortran code	. 10406
	65.7.4	lisp code	. 10410

			- Positive Definite							
	66.1	dposv								10419
		66.1.1	Axiom unit tests .							10419
		66.1.2	Axiom help page							10419
		66.1.3	fortran code							10421
		66.1.4	lisp code							10422
	66.2	dposvx								10424
		66.2.1	Axiom unit tests							10424
			Axiom help page							
			fortran code							
			lisp code							
	66.3		X							
		-	Axiom unit tests							
			Axiom help page [?]							
			fortran code							
			lisp code							
	66 4									
	00.1	-	Axiom unit tests .							
			Axiom help page							
			fortran code							
			lisp code							
		00.1.1	nsp code							10400
67	LAF	PACK -	- Positive Definite	Matrix.	Linear	Solve.	Real		10	471
		1								
		67.1.1	Axiom unit tests .							10471
			Axiom unit tests . Axiom help page .							
		67.1.2	Axiom help page .							10471
		67.1.2 67.1.3	Axiom help page . fortran code			 				$10471 \\ 10473$
	67.2	67.1.2 67.1.3 67.1.4	Axiom help page . fortran code lisp code	· · · · · · · · · · · · · · · · · · ·		 				$10471 \\ 10473 \\ 10474$
	67.2	67.1.2 67.1.3 67.1.4 sposvx	Axiom help page . fortran code lisp code			 				$10471 \\ 10473 \\ 10474 \\ 10476$
	67.2	67.1.2 67.1.3 67.1.4 sposvx 67.2.1	Axiom help page . fortran code lisp code							$10471 \\ 10473 \\ 10474 \\ 10476 \\ 10476$
	67.2	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2	Axiom help page . fortran code lisp code							$10471 \\ 10473 \\ 10474 \\ 10476 \\ 10476 \\ 10476$
	67.2	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3	Axiom help page . fortran code lisp code							$10471 \\ 10473 \\ 10474 \\ 10476 \\ 10476 \\ 10476 \\ 10481$
		67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4	Axiom help page . fortran code lisp code							$10471 \\ 10473 \\ 10474 \\ 10476 \\ 10476 \\ 10476 \\ 10481 \\ 10484$
		67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx	Axiom help page . fortran code lisp code							$\begin{array}{c} 10471 \\ 10473 \\ 10474 \\ 10476 \\ 10476 \\ 10476 \\ 10481 \\ 10484 \\ 10490 \end{array}$
		67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx 67.3.1	Axiom help page . fortran code							10471 10473 10474 10476 10476 10481 10484 10490 10490
		67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx 67.3.1 67.3.2	Axiom help page . fortran code lisp code							10471 10473 10474 10476 10476 10476 10481 10484 10490 10490 10490
		67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx: 67.3.1 67.3.2 67.3.3	Axiom help page . fortran code							10471 10473 10474 10476 10476 10481 10484 10490 10490 10498
		67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx: 67.3.1 67.3.2 67.3.3	Axiom help page . fortran code lisp code							10471 10473 10474 10476 10476 10481 10484 10490 10490 10498
68	67.3	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx 67.3.1 67.3.2 67.3.3 67.3.4	Axiom help page . fortran code							10471 10473 10474 10476 10476 10481 10484 10490 10490 10498
68	67.3 LAF	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx: 67.3.1 67.3.2 67.3.3	Axiom help page . fortran code	Matrix,		Solve,	Comple			10471 10473 10474 10476 10476 10476 10481 10484 10490 10490 10498 10501
68	67.3 LAF	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx 67.3.1 67.3.2 67.3.3 67.3.4 PACK cposv	Axiom help page . fortran code	Matrix,		Solve,	Comple		10	10471 10473 10474 10476 10476 10476 10481 10484 10490 10490 10498 10501
68	67.3 LAF	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx: 67.3.1 67.3.2 67.3.3 67.3.4 PACK cposv 68.1.1	Axiom help page . fortran code lisp code	Matrix,		Solve,	Comple		10	10471 10473 10474 10476 10476 10476 10481 10484 10490 10490 10498 10501 509
68	67.3 LAF	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx 67.3.1 67.3.2 67.3.3 67.3.4 PACK cposv 68.1.1 68.1.2	Axiom help page . fortran code lisp code	Matrix,	Linear	Solve,	Comple		10	10471 10473 10474 10476 10476 10476 10481 10484 10490 10490 10490 10501 509 10509
68	67.3 LAF	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx 67.3.1 67.3.2 67.3.3 67.3.4 PACK cposv 68.1.1 68.1.2 68.1.3	Axiom help page . fortran code lisp code	Matrix,	Linear	Solve,	Comple	ex	10	10471 10473 10474 10476 10476 10476 10481 10484 10490 10490 10498 10501 509 10509 10509
68	67.3 LAF 68.1	67.1.2 67.1.3 67.1.4 sposvx 67.2.1 67.2.2 67.2.3 67.2.4 sposvx: 67.3.1 67.3.2 67.3.3 67.3.4 PACK - cposv 68.1.1 68.1.2	Axiom help page . fortran code lisp code	Matrix,	Linear	Solve,	Comple	ex	10	10471 10473 10474 10476 10476 10476 10481 10490 10490 10490 10501 509 10509 10509 10511 10512

	68.2.1	Axiom unit tests		 10514
	68.2.2	Axiom help page		 10514
	68.2.3	fortran code		 10519
	68.2.4	lisp code		 10522
68.3		XX		
	68.3.1	Axiom unit tests		 10528
		Axiom help page [?]		
		fortran code		
		lisp code		
69 T.A	РАСК	- Positive Definite Matrix, Linear Solve, Complex	16	10547
05.1	-	Axiom unit tests		
		Axiom help page		
		fortran code		
		lisp code		
69.2				
03.2	-	Axiom unit tests		
		Axiom help page		
		fortran code		
		lisp code		
60.2		x		
09.5	-	Axiom unit tests		
		Axiom help page		
		fortran code		
CO 4		lisp code		
69.4	-	XX		
		Axiom unit tests		
		Axiom help page [?]		
		fortran code		
	69.4.4	lisp code		 10593
		- Positive Definite Matrix, Comp. Routines, Doub		
70.1	-	orcond		
		Axiom unit tests		
		Axiom help page		
	70.1.3	fortran code		 10601
	70.1.4	lisp code		 10605
70.2	dla_po	orfsx_extended		 10611
	70.2.1	Axiom unit tests		 10611
	70.2.2	Axiom help page [?]		 10612
	70.2.3	fortran code		 10617
	70.2.4	lisp code		 10623
70.3	dla_po	orpvgrw		 10630
	70.3.1	Axiom unit tests		 10630
	70.3.2	Axiom help page		 10630

		fortran code							
		lisp code							
70.4	dpocor	1	 	 	 	 	 	 	 10637
	70.4.1	Axiom unit tests	 	 	 	 	 	 	 10637
	70.4.2	Axiom help page	 	 	 	 	 	 	 10637
	70.4.3	for tran code	 	 	 	 	 	 	 10639
	70.4.4	lisp code	 	 	 	 	 	 	 10641
70.5	dpoeq	1	 	 	 	 	 	 	 10645
	70.5.1	Axiom unit tests	 	 	 	 	 	 	 10645
	70.5.2	Axiom help page	 	 	 	 	 	 	 10645
		fortran code							
		lisp code							
70.6		ıb							
		Axiom unit tests							
		Axiom help page							
		fortran code							
		lisp code							
70.7									
		Axiom unit tests							
		Axiom help page							
		fortran code							
		lisp code							
70.8		X							
10.0	-	Axiom unit tests							
		Axiom help page of							
		fortran code							
		lisp code							
70.0									
10.9	-	Axiom unit tests							
		Axiom help page							
		fortran code							
70.1		lisp code							
10.1									
		Axiom unit tests							
		Axiom help page							
		Sfortran code							
70.1		lisp code							
70.1	-	2							
		Axiom unit tests							
		Axiom help page							
		fortran code							
5 0 <		lisp code							
70.1	-								
		Axiom unit tests							
		Axiom help page							
	70.12.3	fortran code	 	 	 	 	 	 	 10709

71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	70.12.4 lisp code	10710
70.13.2 Axiom help page 1071: 70.13.3 fortran code 1071: 70.13.4 lisp code 1071: 71 LAPACK - Positive Definite Matrix, Comp. Routines, Real 10719 71.1 sla.porcond 1071: 71.1.1 Axiom unit tests 1071: 71.1.2 Axiom help page 1072 71.1.3 fortran code 1072 71.1.4 lisp code 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla.porpygrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.5.3 fortran code	70.13dpotrs	10712
70.13.3 fortran code 1071- 70.13.4 lisp code 1071- 71 LAPACK - Positive Definite Matrix, Comp. Routines, Real 10719 71.1 sla-porcond 1071- 71.1.2 Axiom unit tests 1071- 71.1.3 fortran code 1072- 71.1.4 lisp code 1072- 71.2 sla-porfsx_extended 1073- 71.2.1 Axiom unit tests 1073- 71.2.2 Axiom help page [?] 1073- 71.2.3 fortran code 1073- 71.2.4 lisp code 1074- 71.3 sla-porpygrw 1075- 71.3.1 Axiom unit tests 1075- 71.3.2 Axiom help page 1075- 71.3.3 fortran code 1075- 71.3.4 lisp code 1075- 71.4.2 Axiom help page 1075- 71.4.3 fortran code 1075- 71.4.4 Axiom unit tests 1075- 71.4.2 Isp code 1075- 71.4.3 fortran code 1075- 71.5.1 Axiom unit tests 1076- 71.5.2 Axiom help page 1076- 71.5.3 fortran code 1076- 71.6.4 lisp code 1077- 71.6.3	70.13.1 Axiom unit tests	10712
70.13.4lisp code 10719 71 LAPACK - Positive Definite Matrix, Comp. Routines, Real 10719 71.1.1 sla-porcond 10719 71.1.2 Axiom unit tests 10711 71.1.3 fortran code 1072 71.1.4 lisp code 1072 71.1.4 lisp code 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1073 71.3 sla-portpygrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1077	70.13.2 Axiom help page	10712
71 LAPACK - Positive Definite Matrix, Comp. Routines, Real 10719 71.1 sla.porcond 10711 71.1.1 Axiom unit tests 10711 71.1.2 Axiom help page 10712 71.1.3 fortran code 10722 71.1.4 lisp code 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpvgrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1075 71.4.2 Axiom help page 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.5.2 Axiom help page 1076 71.6	70.13.3 fortran code	10714
71 LAPACK - Positive Definite Matrix, Comp. Routines, Real 10719 71.1 sla.porcond 10711 71.1.1 Axiom unit tests 10711 71.1.2 Axiom help page 10712 71.1.3 fortran code 10722 71.1.4 lisp code 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpvgrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1075 71.4.2 Axiom help page 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.5.2 Axiom help page 1076 71.6	70.13.4 lisp code	10715
71.1 sla_porcond 1071: 71.1.1 Axiom unit tests 1071: 71.1.2 Axiom help page 1072: 71.1.3 fortran code 1072: 71.1.4 lisp code 1073: 71.2.1 Axiom unit tests 1073: 71.2.2 Axiom help page [?] 1073: 71.2.3 fortran code 1074: 71.2.4 lisp code 1074: 71.3.1 Axiom unit tests 1075: 71.3.2 Axiom help page 1075: 71.3.3 fortran code 1075: 71.3.4 lisp code 1075: 71.4.1 Axiom unit tests 1075: 71.4.2 Axiom help page 1075: 71.4.3 fortran code 1075: 71.4.4 lisp code 1076: 71.5.1 Axiom unit tests 1076: 71.5.2 Axiom help page 1076: 71.5.3 fortran code 1076: 71.5.4 lisp code 1076: 71.5.2 Axiom help page 1076: 71.5.3 fortran code 1076: 71.5.4 kisp code 1076: 71.5.1 Axiom unit tests 1076: 71.6.3 fortran code 1077: 71.6.4 lisp code 1077: <td>•</td> <td></td>	•	
71.1.1 Axiom unit tests 1071: 71.1.2 Axiom help page 1071: 71.1.3 fortran code 1072: 71.1.4 lisp code 1073: 71.2.1 Axiom unit tests 1073: 71.2.2 Axiom help page [?] 1073: 71.2.3 fortran code 1073: 71.2.4 lisp code 1074: 71.3 sla-porpygrw 1075: 71.3.1 Axiom unit tests 1075: 71.3.2 Axiom help page 1075: 71.3.3 fortran code 1075: 71.3.4 lisp code 1075: 71.4 spocon 1075: 71.4.1 Axiom unit tests 1075: 71.4.2 Axiom help page 1075: 71.4.3 fortran code 1076: 71.4.4 lisp code 1076: 71.5.1 Axiom unit tests 1076: 71.5.2 Axiom help page 1076: 71.5.3 fortran code 1076: 71.5.4 lisp code 1076: 71.6.1 Axiom unit tests 1077: 71.6.2 Axiom help page 1077: 71.6.3 fortran code 1077: 71.6.4 lisp code 1077: 71.7.1 Axiom unit tests 1077: <td>71 LAPACK - Positive Definite Matrix, Comp. Routines, Real</td> <td>10719</td>	71 LAPACK - Positive Definite Matrix, Comp. Routines, Real	10719
71.1.2 Axiom help page 1071 71.1.3 fortran code 1072 71.1.4 lisp code 1072 71.2 sla_porfsx_extended 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpygrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 <t< td=""><td>71.1 sla_porcond</td><td> 10719</td></t<>	71.1 sla_porcond	10719
71.1.2 Axiom help page 1071 71.1.3 fortran code 1072 71.1.4 lisp code 1072 71.2 sla_porfsx_extended 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpygrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 <t< td=""><td>71.1.1 Axiom unit tests</td><td> 10719</td></t<>	71.1.1 Axiom unit tests	10719
71.1.3 fortran code 1072 71.1.4 lisp code 1072 71.2 sla.porfsx.extended 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla.porpygrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1077	71.1.2 Axiom help page	10719
71.2 sla_porfsx_extended 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpvgrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1076 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 <t< td=""><td>71.1.3 fortran code</td><td> 10721</td></t<>	71.1.3 fortran code	10721
71.2 sla_porfsx_extended 1073 71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpvgrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1076 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 <t< td=""><td>71.1.4 lisp code</td><td> 10725</td></t<>	71.1.4 lisp code	10725
71.2.1 Axiom unit tests 1073 71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpygrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1076 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.7.4 lisp code 1078 71		
71.2.2 Axiom help page [?] 1073 71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla_porpvgrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1076 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.5 spoequb 1076 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.7.5 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom	•	
71.2.3 fortran code 1073 71.2.4 lisp code 1074 71.3 sla-porpygrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.5 spoequb 1076 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.5 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx <td></td> <td></td>		
71.2.4 lisp code 1074 71.3 sla-porpvgrw 1075 71.3.1 Axiom unit tests 1075 71.3.2 Axiom help page 1075 71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1076 71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.1 Axiom unit tests 1077 71.7.3 fortran code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1078 71.8.1 Axiom unit tests 1079		
71.3 sla_porpygrw 10756 71.3.1 Axiom unit tests 10756 71.3.2 Axiom help page 10757 71.3.3 fortran code 10757 71.3.4 lisp code 10757 71.4.1 Axiom unit tests 10757 71.4.2 Axiom help page 10757 71.4.3 fortran code 10756 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 10766 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1076 71.6.2 Axiom help page 10770 71.6.3 fortran code 10770 71.6.4 lisp code 10770 71.7.1 Axiom unit tests 10770 71.7.2 Axiom help page 10770 71.7.3 fortran code 10770 71.7.4 lisp code 10770 71.7.4 lisp code 1078 71.8 sporfsx 1078 71.8.1 Axiom unit tests 1079 71.8.2 Axiom help page 10770 71.7.1 Axiom unit tests 10770 71.7.2 Axiom help page 10770 <		
71.3.1 Axiom unit tests 10756 71.3.2 Axiom help page 10756 71.3.3 fortran code 10757 71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1076 71.4.4 lisp code 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.7.5 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1078 71.8.1 Axiom unit tests 1079 71.8.1 Axiom unit tests 1079	<u>.</u>	
71.3.2 Axiom help page 10756 71.3.3 fortran code 10755 71.3.4 lisp code 10755 71.4 spocon 10757 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 10765 71.4.4 lisp code 1076 71.5.5 paequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8.1 Axiom unit tests 1079 71.8.1 Axiom unit tests 1079 71.8.1 Axiom unit tests 1079 71.8.1 Axiom unit tests 1079 71.8.1 Axiom unit tests 1079 71.8.	1 1 0	
71.3.3 fortran code 1075 71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1076 71.5 spoequ 1076 71.5 sycom 1076 71.5 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1076 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1078 71.8.1 Axiom unit tests 1079 71.8.1 Axiom unit tests 1079		
71.3.4 lisp code 1075 71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8.1 Axiom unit tests 1079 71.8.1 Axiom unit tests 1079	110	
71.4 spocon 1075 71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1075 71.4.4 lisp code 1076 71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.7.5 sporfs 1078 71.7.1 Axiom unit tests 1079 71.7.3 fortran code 1078 71.7.4 lisp code 1078 71.8.1 Axiom unit tests 1079		
71.4.1 Axiom unit tests 1075 71.4.2 Axiom help page 1075 71.4.3 fortran code 1076 71.4.4 lisp code 1076 71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.4.2 Axiom help page 1075 71.4.3 fortran code 1076 71.4.4 lisp code 1076 71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1078 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	•	
71.4.3 fortran code 1076 71.4.4 lisp code 1076 71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1078 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.4.4 lisp code 1076 71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.5 spoequ 1076 71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1078 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.5.1 Axiom unit tests 1076 71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1078 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.5.2 Axiom help page 1076 71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	· ·	
71.5.3 fortran code 1076 71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.5.4 lisp code 1076 71.6 spoequb 1077 71.6.1 Axiom unit tests 1077 71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1078 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.6 spoequb 10770 71.6.1 Axiom unit tests 10770 71.6.2 Axiom help page 10770 71.6.3 fortran code 10771 71.6.4 lisp code 10770 71.7 sporfs 10770 71.7.1 Axiom unit tests 10770 71.7.2 Axiom help page 10770 71.7.3 fortran code 10770 71.7.4 lisp code 10780 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	71.5.3 fortran code	10766
71.6.1 Axiom unit tests 10770 71.6.2 Axiom help page 10771 71.6.3 fortran code 10772 71.6.4 lisp code 10773 71.7 sporfs 10774 71.7.1 Axiom unit tests 10774 71.7.2 Axiom help page 10774 71.7.3 fortran code 10775 71.7.4 lisp code 10785 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	71.5.4 lisp code	10768
71.6.2 Axiom help page 1077 71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	71.6 spoequb	10770
71.6.3 fortran code 1077 71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	71.6.1 Axiom unit tests	10770
71.6.4 lisp code 1077 71.7 sporfs 1077 71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	71.6.2 Axiom help page	10770
71.7 sporfs 10773 71.7.1 Axiom unit tests 10774 71.7.2 Axiom help page 10776 71.7.3 fortran code 10776 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	71.6.3 fortran code	10772
71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079	71.6.4 lisp code	10774
71.7.1 Axiom unit tests 1077 71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.7.2 Axiom help page 1077 71.7.3 fortran code 1077 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.7.3 fortran code 10773 71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.7.4 lisp code 1078 71.8 sporfsx 1079 71.8.1 Axiom unit tests 1079		
71.8 sporfsx		
71.8.1 Axiom unit tests	<u>.</u>	
	•	
	71.8.2 Axiom help page [?]	10791

71.8.3 fortran code									
71.8.4 lisp code									10803
$71.9 \text{ spotf2} \dots \dots \dots$									10803
71.9.1 Axiom unit tests .									10803
71.9.2 Axiom help page .									10803
71.9.3 fortran code									
71.9.4 lisp code									10807
71.10spotrf									10810
$71.10.1\mathrm{Axiom}$ unit tests .									10810
$71.10.2\mathrm{Axiom\ help\ page}$.									
71.10.3 fortran code									
71.10.4 lisp code									10815
71.11spotrf2									10820
71.11.1 Axiom unit tests .									10820
71.11.2 Axiom help page .									
71.11.3 fortran code									10821
71.11.4 lisp code									10824
71.12spotri									10827
$71.12.1\mathrm{Axiom}$ unit tests .									10827
$71.12.2\mathrm{Axiom\ help\ page}$.									10828
71.12.3 fortran code									10829
71.12.4 lisp code									10830
71.13spotrs									
±									
71.13.1 Axiom unit tests .									10832
$71.13.2\mathrm{Axiom}$ help page .									10832
									10832
$71.13.2\mathrm{Axiom}$ help page .								 	10832 10833
71.13.2 Axiom help page . $71.13.3$ fortran code $71.13.4$ lisp code									10832 10833 10835
$71.13.2\mathrm{Axiom\ help\ page}~.$ $71.13.3\mathrm{fortran\ code}~.~.~.$ $71.13.4\mathrm{lisp\ code}~.~.~.~.$ $\mathbf{72\ LAPACK\ -\ Positive\ Definite}$	 	 				 	olex	 	10832 10833 10835
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c	 e M a	 atr i x,			 tines,	 	 olex		10832 10833 10835 0839 10839
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests .	 e M a	 atrix, 	 Comp		tines,	Comj	olex	10	10832 10833 10835 0839 10839 10839
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla-porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page .	 e M a 	 atrix, 	Comp		$ ag{tines},$	Comp	olex	10	10832 10833 10835 0839 10839 10839 10839
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code	 e Ма	atrix,	Comp		tines,	Comj	olex	10	10832 10833 10835 0839 10839 10839 10839 10841
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code	e M a	atrix,	Comp	o. Rou	tines,	Comp	olex	10	10832 10833 10835 0839 10839 10839 10839 10841 10845
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.2 cla_porcond_x	e M a	atrix,	Comp	o. Rou	tines,	Comp	olex	10	10832 10833 10835 0839 10839 10839 10839 10841 10845 10850
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.2 cla_porcond_x 72.2.1 Axiom unit tests .	e M a	atrix,	Comp	o. Rou	tines,	Comp	olex	10	10832 10833 10835 0839 10839 10839 10841 10845 10850 10850
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.2 cla_porcond_x 72.2.1 Axiom unit tests . 72.2.2 Axiom help page .	e M a	atrix,	Comp	o. Rou	tines,	Comp	olex	10	10832 10833 10835 0839 10839 10839 10841 10845 10850 10850 10851
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.1.4 lisp code 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code	e M a	atrix,	Comp	o. Rou	tines,	Comj	olex	10	10832 10833 10835 0839 10839 10839 10839 10841 10845 10850 10850 10851 10852
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.2 cla_porcond_x 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code 72.2.4 lisp code	e M a	ntrix,	Comp	D. Rou	tines,	Comp	olex	10	10832 10833 10835 0839 10839 10839 10839 10841 10845 10850 10851 10852 10855
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.2 cla_porcond_x 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code 72.2.4 lisp code 72.2.4 lisp code 72.3 cla_porfsx_extended	e Ma	atrix,	Comp	b. Rou	tines,	Comp	olex	10	10832 10833 10835 10839 10839 10839 10841 10845 10850 10851 10852 10855 10860
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code 72.2.4 lisp code 72.2.4 lisp code 72.3.1 Axiom unit tests .	e M a	atrix,	Comp	o. Rou	tines,	Comp	olex	10	10832 10833 10835 10839 10839 10839 10841 10845 10850 10850 10851 10852 10855 10860 10860
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72 LAPACK - Positive Definite 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code 72.2.4 lisp code 72.3.4 Lisp code 72.3.5 Axiom unit tests . 72.3.6 La_porfsx_extended 72.3.7 Axiom unit tests .	e M a	atrix,	Comp	o. Rou	tines,	Comp	olex	10	10832 10833 10835 10839 10839 10839 10841 10845 10850 10850 10851 10852 10865 10860 10860
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.1.4 lisp code 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code 72.2.4 lisp code 72.2.4 lisp code 72.3.1 Axiom unit tests . 72.3.2 Axiom help page [? 72.3.3 fortran code	e M a	atrix,	Comp	o. Rou	tines,	Comp	olex	10	10832 10833 10835 10839 10839 10839 10841 10845 10850 10850 10851 10852 10860 10860 10860 10861 10866
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.1.4 lisp code 72.2 cla_porcond_x 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code 72.2.4 lisp code 72.3.4 lisp code 72.3.5 Axiom unit tests . 72.3.6 Axiom help page [? 72.3.7 Axiom help page [? 72.3.8 fortran code 72.3.9 Axiom help page [?	e M a	atrix,	Comp	D. Rou	tines,	Comp	olex		10832 10833 10835 10839 10839 10839 10839 10841 10845 10850 10851 10852 10855 10860 10860 10861 10866 10872
71.13.2 Axiom help page . 71.13.3 fortran code 71.13.4 lisp code 72.1 cla_porcond_c 72.1.1 Axiom unit tests . 72.1.2 Axiom help page . 72.1.3 fortran code 72.1.4 lisp code 72.1.4 lisp code 72.2.1 Axiom unit tests . 72.2.2 Axiom help page . 72.2.3 fortran code 72.2.4 lisp code 72.2.4 lisp code 72.3.1 Axiom unit tests . 72.3.2 Axiom help page [? 72.3.3 fortran code	e M a	atrix,	Comp	D. Rou	tines,	Comp	olex		10832 10833 10835 10839 10839 10839 10839 10841 10845 10850 10851 10852 10855 10860 10861 10866 10872 10879

72.4.2 Axiom help page	10880
72.4.3 fortran code	10881
72.4.4 lisp code	10883
72.5 cpocon	
72.5.1 Axiom unit tests	
72.5.2 Axiom help page	
72.5.3 fortran code	10888
72.5.4 lisp code	10891
72.6 cpoequ	10894
	10894
1 1 0	10895
72.6.3 fortran code	10896
72.6.4 lisp code	10898
72.7 cpoequb	10900
72.7.1 Axiom unit tests	10900
72.7.2 Axiom help page	10900
72.7.3 fortran code	10901
72.7.4 lisp code	10903
72.7.4 hsp code	10905
72.8.1 Axiom unit tests	10905
1 1 0	10906
72.8.3 fortran code	10908
72.8.4 lisp code	10913
72.9 cporfsx	10921
72.9.1 Axiom unit tests	10921
72.9.2 Axiom help page [?]	10921
72.9.3 fortran code	10927
72.9.4 lisp code	10933
72.10cpotf2	10933
72.10.1 Axiom unit tests	10933
72.10.2 Axiom help page	10933
72.10.3 fortran code	10935
72.10.4 lisp code	10937
72.11cpotrf	10941
72.11.1 Axiom unit tests	10941
72.11.2 Axiom help page	10942
72.11.3 fortran code	10943
72.11.4 lisp code	10946
72.12cpotrf2	10951
72.12.1 Axiom unit tests	10951
72.12.2 Axiom help page	10951
72.12.3 fortran code	10952
	10952 10955
72.12.4 lisp code	
72.13cpotri	10959
72.13.1 Axiom unit tests	10959
72.13.2 Axiom help page	10959

CONTENTS	317

		72.13.3 fortran code	. 10960
		72.13.4 lisp code	
	72.14	4cpotrs	
		72.14.1 Axiom unit tests	
		72.14.2 Axiom help page	
		72.14.3 fortran code	
		72.14.4 lisp code	
		72.11.11isp code	. 10001
73	LAF	PACK - Positive Definite Matrix, Comp. Routines, Complex16 1	.0971
		zla_porcond_c	
		73.1.1 Axiom unit tests	. 10971
		73.1.2 Axiom help page	. 10971
		73.1.3 fortran code	
		73.1.4 lisp code	
	73.2	zla_porcond_x	
		73.2.1 Axiom unit tests	
		73.2.2 Axiom help page	
		73.2.3 fortran code	
		73.2.4 lisp code	
	73.3	zla_porfsx_extended	
	10.0	73.3.1 Axiom unit tests	
		73.3.2 Axiom help page [?]	
		73.3.3 fortran code	
		73.3.4 lisp code	
	73.4	zla_porpvgrw	
	10.4	73.4.1 Axiom unit tests	
		73.4.2 Axiom help page	
		73.4.3 fortran code	
		73.4.4 lisp code	
	79 5	zpocon	
	15.5	73.5.1 Axiom unit tests	
		73.5.2 Axiom help page	
	72.6	73.5.4 lisp code	
	73.0	zpoequ	
		73.6.1 Axiom unit tests	
		73.6.2 Axiom help page	
		73.6.3 fortran code	
		73.6.4 lisp code	
	73.7	zpoequb	
		73.7.1 Axiom unit tests	
		73.7.2 Axiom help page	
		73.7.3 fortran code	
		73.7.4 lisp code	
	73.8	zporfs	
		73.8.1 Axiom unit tests	. 11038

73.8.2 Axiom help page	11038
73.8.3 fortran code	11041
73.8.4 lisp code	11045
73.9 zporfsx	11053
73.9.1 Axiom unit tests	11053
73.9.2 Axiom help page [?]	11054
73.9.3 fortran code	
73.9.4 lisp code	11065
73.10zpotf2	11066
73.10.1 Axiom unit tests	
73.10.2 Axiom help page	11066
73.10.3 fortran code	
73.10.4 lisp code	
73.11zpotrf	
73.11.1 Axiom unit tests	
73.11.2 Axiom help page	11074
73.11.3 fortran code	
73.11.4 lisp code	
73.12zpotrf2	11083
73.12.1 Axiom unit tests	
73.12.2 Axiom help page	11084
73.12.3 fortran code	
73.12.4 lisp code	11088
73.13zpotri	11091
73.13.1 Axiom unit tests	11091
73.13.2 Axiom help page	11092
73.13.3 fortran code	11093
73.13.4 lisp code	11094
73.14zpotrs	11096
73.14.1 Axiom unit tests	11096
73.14.2 Axiom help page	11096
73.14.3 fortran code	11097
73.14.4 lisp code	11099
74 LAPACK - General Tridiagonal Matrix, Linear Solve, Double	11103
74.1 dgtsv	
74.1.1 Axiom unit tests	
74.1.2 Axiom help page	
74.1.3 fortran code	
74.1.4 lisp code	
74.2 dgtsvx	
74.2.1 Axiom unit tests	
74.2.2 Axiom help page	
74.2.3 fortran code	
74 2 4 lisp code	11123

19	LAF	PACK	- General Tridia	ıgonal	Matrix,	Linear	Solve,	Real	11129
	75.1	sgtsv .							11129
		75.1.1	Axiom unit tests						11129
		75.1.2	Axiom help page						11129
			fortran code						
			lisp code						
	75.2								
		_	Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
			nop code						
7 6	LAF	PACK	- General Tridia	igonal	Matrix,	Linear	Solve,	Complex	11155
		_	Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
	76.2								
	.0.2	_	Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
		10.2.1	nop code						11110
77	LAF	PACK	- General Tridia	igonal	Matrix,	Linear	Solve,	Complex16	11175
		77.1.1	Axiom unit tests						11175
			Axiom help page						
		77.1.4							
	77.2		lisp code						11179
	77.2	zgtsvx	lisp code						11179 11183
	77.2	$\begin{array}{c} {\rm zgtsvx} \\ 77.2.1 \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$						11179 11183 11183
	77.2	zgtsvx 77.2.1 77.2.2	$\begin{tabular}{lll} lisp code$						11179 11183 11183 11183
	77.2	zgtsvx 77.2.1 77.2.2 77.2.3	lisp code						11179 11183 11183 11187
	77.2	zgtsvx 77.2.1 77.2.2 77.2.3	$\begin{tabular}{lll} lisp code$						11179 11183 11183 11187
78		zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4	lisp code						11179 11183 11183 11183 11187 11190
	LAF	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK	lisp code			Comp.		nes, Double	11179 11183 11183 11187 11190
	LAF	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK dgtcon	lisp code	agonal		Comp.		nes, Double	11179 11183 11183 11183 11187 11190 11195 11195
	LAF	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK dgtcon 78.1.1	lisp code	agonal	Matrix,	Comp.	Routi	nes, Double	11179 11183 11183 11187 11190 11195 11195 11195
	LAF	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK dgtcom 78.1.1 78.1.2	lisp code	gonal	Matrix,	Comp.	Routi	nes, Double	11179 11183 11183 11187 11190 11195 11195 11195
	LAF	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK dgtcom 78.1.1 78.1.2 78.1.3	Axiom unit tests Axiom help page fortran code General Tridia Axiom unit tests Axiom unit tests Axiom unit tests Axiom help page fortran code	agonal	Matrix,	Comp.	Routi	nes, Double	
	LAF 78.1	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK dgtcom 78.1.1 78.1.2 78.1.3 78.1.4	lisp code	agonal	Matrix,	Comp.	Routi	nes, Double	
	LAF 78.1	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK dgtcon 78.1.1 78.1.2 78.1.3 78.1.4 dgtrfs	lisp code	agonal	Matrix,	Comp.	Routi	nes, Double	
	LAF 78.1	zgtsvx 77.2.1 77.2.2 77.2.3 77.2.4 PACK dgtcom 78.1.1 78.1.2 78.1.3 78.1.4 dgtrfs 78.2.1	lisp code	agonal	Matrix,	Comp.	Routi	nes, Double	

		78.2.4	lisp code				 		 							11210
	78.3	dgttrf					 									11219
		78.3.1	Axiom unit tests				 		 							11219
		78.3.2	Axiom help page				 		 							11219
		78.3.3	for tran code				 		 							11221
		78.3.4	lisp code				 		 							11223
	78.4	dgttrs					 		 							11226
		78.4.1	Axiom unit tests				 									11226
		78.4.2	Axiom help page				 									11227
		78.4.3	fortran code				 		 							11228
		78.4.4	lisp code				 									11230
	78.5	dgtts2					 		 							11232
		78.5.1	Axiom unit tests				 		 							11232
		78.5.2	Axiom help page				 		 							11233
		78.5.3	for tran code				 		 							11234
		78.5.4	lisp code				 		 							11237
7 9			- General Tridia	_					_			-				
	79.1	_														
			Axiom unit tests													
			Axiom help page													
			fortran code													
			lisp code													
	79.2	_														
			Axiom unit tests													
			Axiom help page													
			fortran code													
	5 0.0		lisp code													
	79.3	0														
			Axiom unit tests													
			Axiom help page													
			fortran code													
	70.4		lisp code													
	79.4	0														
			Axiom unit tests													
			Axiom help page													
			fortran code													11278
	70.5		lisp code													11280
	79.5	_														11282
			Axiom unit tests													11282
			Axiom help page													
			fortran code													
		79.5.4	lisp code				 		 							11287

80	LAF	PACK	- General Tridia	igonal	Matrix,	Comp.	Routines,	Complex	11295
	80.1	cgtcon							11295
		80.1.1	Axiom unit tests						11295
		80.1.2	Axiom help page						11295
		80.1.3	fortran code						11297
		80.1.4	lisp code						11299
	80.2	cgtrfs							11302
		80.2.1	Axiom unit tests						11302
		80.2.2	Axiom help page						11302
			fortran code						
			lisp code						
	80.3								
			Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
	80.4								
			Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
	80.5								
	00.0		Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
		00.0.1	nsp code						11010
81	LAF	PACK	- General Tridia	gonal	Matrix,	Comp.	Routines,	Complex16	11351
		0	Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
	81.2								
		_	Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
	81.3								
	01.0		Axiom unit tests						
			Axiom help page						
			fortran code						
			lisp code						
	81 /								
	01.4		Axiom unit tests						
			Axiom unit tests Axiom help page						
		01.4.4	тупош пето рабе						11304

	81.4.3	fortran code	11385
	81.4.4	$lisp\ code\ .\ .\ .\ .\ .\ .\ .\ .$	11387
81.5	zgtts2		11390
	81.5.1	Axiom unit tests	11390
	81.5.2	Axiom help page	11390
	81.5.3	fortran code	11392
	81.5.4	lisp code	11396
00 T A 1	DACK	Desitive Definite Tridingenal Matrix Linear Selve Double 11	407
		- Positive Definite Tridiagonal Matrix, Linear Solve, Double 11	
02.1	-	Axiom unit tests	
		Axiom unit tests	
		fortran code	
		lisp code	
99 <u>9</u>		x	
82.2			
		Axiom unit tests	
		Axiom help page	
		fortran code	
	82.2.4	lisp code	11417
83 LA	PACK	- Positive Definite Tridiagonal Matrix, Linear Solve, Real 11	421
	-	Axiom unit tests	
		Axiom help page	
		fortran code	
		lisp code	
83.2		C	
	-	Axiom unit tests	
		Axiom help page	
		fortran code	
		lisp code	
		•	
	PACK	- Positive Definite Tridiagonal Matrix, Linear Solve, Complex	435
84.1		, , ,	
	84.1.1	Axiom unit tests	11435
	84.1.1 84.1.2	Axiom unit tests	11435 11435
	84.1.1 84.1.2	Axiom unit tests	11435 11435
	84.1.1 84.1.2 84.1.3 84.1.4	Axiom unit tests	11435 11435 11437 11438
84.2	84.1.1 84.1.2 84.1.3 84.1.4 cptsvx	Axiom unit tests Axiom help page fortran code lisp code	11435 11435 11437 11438 11439
84.2	84.1.1 84.1.2 84.1.3 84.1.4 cptsvx 84.2.1	Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests	11435 11435 11437 11438 11439 11439
84.2	84.1.1 84.1.2 84.1.3 84.1.4 cptsvx 84.2.1 84.2.2	Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests Axiom unit tests Axiom help page	11435 11435 11437 11438 11439 11439
84.2	84.1.1 84.1.2 84.1.3 84.1.4 cptsvx 84.2.1 84.2.2	Axiom unit tests Axiom help page fortran code lisp code Axiom unit tests	11435 11435 11437 11438 11439 11439

85	LAF	ACK ·	· Positive Definite	\mathbf{Tr}	idi	ago	ona	1 N	Iat	rix	, L	ine	ar	Sol	ve,	\mathbf{C}	or	np	le:	x16	3 449
	85.1	zptsv .																			11449
		85.1.1	Axiom unit tests $$.																		11449
		85.1.2	Axiom help page .																		11449
		85.1.3	for tran code																		11451
		85.1.4	lisp code																		11452
	85.2	zptsvx																			11453
		85.2.1	Axiom unit tests .																		11453
		85.2.2	Axiom help page .																		11454
		85.2.3	fortran code																		11457
		85.2.4	lisp code																		11459
		~	5 5 6	_					. .		_			_		_		_			
86			Positive Definite			_							_								
	86.1	-																			
			Axiom unit tests .																		
			Axiom help page .																		
			fortran code																		
			lisp code																		
	86.2																				
			Axiom unit tests .																		
			Axiom help page $\ .$																		
			for tran code																		
		86.2.4	lisp code																		11473
	86.3	-																			
		86.3.1	Axiom unit tests $\ .$																		11476
		86.3.2	Axiom help page $\ .$																		11476
		86.3.3	for tran code																		11478
		86.3.4	lisp code																		11483
	86.4	dpttrf																			11489
		86.4.1	Axiom unit tests .																		11489
		86.4.2	Axiom help page .																		11489
		86.4.3	fortran code																		11490
		86.4.4	lisp code																		11492
	86.5	dpttrs																			11495
		86.5.1	Axiom unit tests .																		11495
		86.5.2	Axiom help page .																		11495
			fortran code																		
			lisp code																		
	86.6																				
	-	-	Axiom unit tests .																		
			Axiom help page .																		
			fortran code																		
			lisp code																		

87	LAF	PACK ·	- Positive De	${ m finit}\epsilon$	T	ric	liag	gona	1 M	[at	rix,	Co	mp.	\mathbf{R}	out	ine	s,	Re	e al 1	1505
	87.1	sptcon																		11505
		87.1.1	Axiom unit tes	sts .																11505
			Axiom help pa																	
			fortran code.																	
			lisp code																	
	87.2																			
	01.2		Axiom unit tes																	
			Axiom help pa																	
			fortran code .																	
			lisp code																	
	07.2																			
	01.3	1																		
			Axiom unit tes																	
			Axiom help pa	_																
			fortran code .																	
			lisp code																	
	87.4	-																		
			Axiom unit tes																	
			Axiom help pa																	
			fortran code .																	
		87.4.4	lisp code																	11534
	87.5	spttrs																		11537
		87.5.1	Axiom unit tes	${ m sts}$.																11537
		87.5.2	Axiom help pa	ge .																11537
		87.5.3	fortran code .																	11539
		87.5.4	lisp code																	11540
	87.6																			
		-	Axiom unit tes																	
			Axiom help pa																	
			fortran code .	_																
			lisp code																	
		01.0.1	nsp code		•					•							•	•		11010
88	LAF	PACK -	- Positive De	finite	e 7	Crio	diag	gona	1 N	Iat	rix	. Co	mp.	\mathbf{R}	out	tine	es,	\mathbf{C}	om	_
	plex						•					,	-				,			L 547
																				11547
		-	Axiom unit tes																	
			Axiom help pa																	
			fortran code.	_																
			lisp code																	
	88 2																			
	00.2		Axiom unit tes																	
			Axiom help pa	_																
			fortran code.																	
	00.9		lisp code																	
	88.3																			
		88.3.1	Axiom unit tes	sts .																-11560

25
2

		88 3 2	Axiom help page																								11560
			fortran code																								
			lisp code																								
	00.4		•																								
	88.4	-																									
			Axiom unit tests																								
			Axiom help page																								
			fortran code																								
			lisp code																								
	88.5	cpttrs																									11585
		88.5.1	Axiom unit tests																								11585
		88.5.2	Axiom help page																								11585
		88.5.3	fortran code																								11587
		88.5.4	lisp code																								11589
	88.6																										
		-	Axiom unit tests																								
			Axiom help page																								
			fortran code																								
			lisp code																								
		00.0.4	nsp code	•	•	•	•	•	•	•	•	•	•	•		•		•	•		•	•	•	•	•	•	11000
89	LAF	PACK	- Positive Defin	it.e	י ב	Гъ	iа	iac	υn.	กล	1 1	VΓε	tr	iv	(്വ	mr		R	OI.	ıti	'n	25	(70	m	_
00	plex		1 oblive Belli						50.						, -			•	_ `	•			,	, `	-		601
	09.1	-	Axiom unit tests																								
			Axiom help page																								
			fortran code																								
	00.0		lisp code																								
	89.2																										
			Axiom unit tests																								
			Axiom help page																								
		89.2.3	fortran code																								11609
		89.2.4	lisp code																								11611
	89.3	zptrfs																									11614
		89.3.1	Axiom unit tests																								11614
		89.3.2	Axiom help page																								11614
		89.3.3	fortran code																								11616
		89.3.4	lisp code																								11622
	89.4																										
	00.1																										
			Axiom unit tests								•		•	•													
			Axiom unit tests																								
		89.4.2	Axiom help page																								
		89.4.2 89.4.3	Axiom help page fortran code																								11633
	00.5	89.4.2 89.4.3 89.4.4	Axiom help page fortran code lisp code																								11633 11636
	89.5	89.4.2 89.4.3 89.4.4 zpttrs	Axiom help page fortran code lisp code							· ·					 		 			 						· ·	11633 11636 11639
	89.5	89.4.2 89.4.3 89.4.4 zpttrs 89.5.1	Axiom help page fortran code lisp code												 		 			 							11633 11636 11639 11639
	89.5	89.4.2 89.4.3 89.4.4 zpttrs 89.5.1 89.5.2	Axiom help page fortran code lisp code												 		 										11633 11636 11639 11639
	89.5	89.4.2 89.4.3 89.4.4 zpttrs 89.5.1 89.5.2 89.5.3	Axiom help page fortran code lisp code												 		 										11633 11636 11639 11639 11641

89.6	5 zptts2																			 11645
	89.6.1	Axiom unit tests																		 11645
	89.6.2	Axiom help page																		 11645
	89.6.3	fortran code																		 11647
	89.6.4	lisp code																		 11649
		•																		
		- Other Auxillia																		1655
90.1	l disnan																			 11655
	90.1.1	Axiom unit tests																		 11655
	90.1.2	Axiom help page																		 11655
	90.1.3	fortran code																		 11656
	90.1.4	lisp code																		 11657
90.2	2 dlabad	l																		 11657
	90.2.1	Axiom unit tests																		 11657
	90.2.2	Axiom help page																		 11657
	90.2.3	fortran code																		 11658
	90.2.4	lisp code																		 11659
90.3																				
	90.3.1	Axiom unit tests																		 11659
	90.3.2	Axiom help page																		 11659
		fortran code																		
		lisp code																		
90.4																				
		Axiom unit tests																		
		Axiom help page																		
		fortran code																		
		lisp code																		
90.																				
00.		Axiom unit tests																		
		Axiom help page																		
		fortran code																		
		lisp code																		
90.6																				
50.0		Axiom unit tests																		
		Axiom help page																		
		fortran code																		
		lisp code																		
00.		insp code																		
90.		Axiom unit tests	-	-	-	 -	-	- '	 -	-	 -	-	-	 -	-	-	 -	-	-	
		Axiom help page																		
		fortran code																		
00.4		lisp code																		
90.8	8 dlagts																			
		Axiom unit tests																		
		Axiom help page																		
	90.8.3	fortran code									 									 -11700

90.8.4 lisp code
90.9 dlaisnan
90.9.1 Axiom unit tests
90.9.2 Axiom help page
90.9.3 fortran code
90.9.4 lisp code
90.10dlamc1
90.10.1 Axiom unit tests
90.10.2 Axiom help page
90.10.3 fortran code
90.10.4 lisp code
90.11dlamc2
90.11.1 Axiom unit tests
90.11.2 Axiom help page
90.11.3 fortran code
90.11.4 lisp code
90.12dlamc3
90.12.1 Axiom unit tests
90.12.2 Axiom help page
90.12.3 fortran code
90.12.4 lisp code
90.13dlamch
90.13.1 Axiom unit tests
90.13.2 Axiom help page
90.13.3 fortran code
90.13.4 lisp code
90.14dlaneg
90.14.1 Axiom unit tests
90.14.2 Axiom help page
90.14.3 fortran code
90.14.4 lisp code
90.15dlanst
90.15.1 Axiom unit tests
90.15.2 Axiom help page
90.15.3 fortran code
90.15.4 lisp code
90.16dlapy2
90.16.1 Axiom unit tests
90.16.2 Axiom help page
90.16.4 lisp code
90.17dlapy3
90.17.1 Axiom unit tests
90.17.2 Axiom help page
90.17.3 fortran code
90.17.4 lisp code

90.18dlarnv														
90.18.1 Axiom unit tests														
90.18.2 Axiom help page					 						 		. :	11735
$90.18.3 \text{fortran code} \dots$					 						 			11736
$90.18.4 \operatorname{lisp\ code}$					 						 			11737
90.19dlarra											 			11739
90.19.1 Axiom unit tests					 						 			11739
90.19.2 Axiom help page											 			11740
90.19.3 fortran code														
$90.19.4 \operatorname{lisp\ code} \dots$														
90.20dlarrb														
90.20.1 Axiom unit tests														
90.20.2 Axiom help page														
90.20.3 fortran code														
90.20.4 lisp code														
90.21dlarrc														
90.21.1 Axiom unit tests														
90.21.2 Axiom help page														
90.21.3 fortran code														
90.21.4 lisp code														
90.21.4 lisp code														
90.22.1 Axiom unit tests														
90.22.2 Axiom help page														
90.22.3 fortran code														
90.22.4 lisp code														
90.23dlarre														
90.23.1 Axiom unit tests														
90.23.2 Axiom help page														
90.23.3 fortran code														
90.23.4 lisp code														
90.24dlarrf														
90.24.1 Axiom unit tests														
90.24.2 Axiom help page														
$90.24.3 \text{fortran code} \dots$														
$90.24.4 \operatorname{lisp\ code}$														
90.25dlarrj														
90.25.1 Axiom unit tests														
90.25.2 Axiom help page														11837
$90.25.3 \text{fortran code} \dots$														11839
$90.25.4 \operatorname{lisp\ code}$. :	11843
90.26dlarrk					 						 		. :	11848
90.26.1 Axiom unit tests											 			11848
90.26.2 Axiom help page											 			11849
90.26.3 fortran code											 			11851
90.26.4 lisp code											 			11853
90.27dlarrr														11855

90.27.1 Axiom unit tests	 			 		 				 11855
$90.27.2\mathrm{Axiom}$ help page										
$90.27.3 \text{fortran code} \dots$										
90.27.4 lisp code										
90.28dlartg										
90.28.1 Axiom unit tests										
$90.28.2\mathrm{Axiom}$ help page										
90.28.3 fortran code										
90.28.4 lisp code										
90.29dlartgp										
90.29.1 Axiom unit tests										
$90.29.2\mathrm{Axiom}$ help page										
90.29.3 fortran code										
90.29.4 lisp code										
90.30dlaruv										
90.30.1 Axiom unit tests										
$90.30.2\mathrm{Axiom}$ help page										
$90.30.3 \text{fortran code} \dots$										
90.30.4 lisp code	 			 		 				 11877
90.31 dlas $2 \dots \dots \dots \dots$	 			 		 				 11885
90.31.1 Axiom unit tests	 			 		 				 11885
90.31.2 Axiom help page										
90.31.3 fortran code	 			 		 				 11887
90.31.4 lisp code	 			 		 				 11888
90.32dlascl	 			 		 				 11889
90.32.1 Axiom unit tests	 			 		 				 11889
90.32.2 Axiom help page	 			 		 				 11889
90.32.3 fortran code	 			 		 				 11891
90.32.4 lisp code	 			 		 				 11895
90.33 dlasd $0 \dots \dots \dots \dots$										
90.33.1 Axiom unit tests	 			 		 				 11896
90.33.2 Axiom help page	 			 		 				 11896
90.33.3 fortran code	 			 		 				 11898
90.33.4 lisp code	 			 		 				 11901
90.34 dlasd $1 \dots \dots \dots \dots$	 			 		 				 11902
90.34.1 Axiom unit tests	 			 		 				 11902
90.34.2 Axiom help page	 			 		 				 11902
90.34.3 fortran code	 			 		 				 11905
90.34.4 lisp code	 			 		 				 11907
90.35 dlasd $2 \dots \dots \dots$	 			 		 				 11907
90.35.1 Axiom unit tests	 			 		 				 11907
90.35.2 Axiom help page										11908
$90.35.3 \text{fortran code} \dots$										11911
90.35.4 lisp code										11918
90.36dlasd3										11918
00.36.1 Axiom unit tosts										11019

$90.36.2\mathrm{Axiom}$ help page																			
90.36.3 fortran code																			
$90.36.4 \operatorname{lisp\ code}$																			
90.37 dlasd $4 \dots \dots \dots \dots$																			
90.37.1 Axiom unit tests																			
$90.37.2\mathrm{Axiom}$ help page																			
90.37.3 fortran code																			
$90.37.4 \operatorname{lisp\ code}$																			
90.38 dlasd $5 \dots \dots \dots \dots$																			11946
90.38.1 Axiom unit tests																			
90.38.2 Axiom help page																			
90.38.3 fortran code																			11948
$90.38.4 \operatorname{lisp\ code}$																			11950
90.39 dlasd $6 \dots \dots \dots \dots$																			11950
90.39.1 Axiom unit tests																			
90.39.2 Axiom help page																			11951
90.39.3 fortran code																			11955
$90.39.4 \operatorname{lisp\ code}$																			11958
90.40 dlasd $7 \dots \dots \dots \dots$																			11958
90.40.1 Axiom unit tests																			11958
90.40.2 Axiom help page																			11958
90.40.3 fortran code																			11962
90.40.4 lisp code																			11968
90.41dlasd8																			11968
90.41.1 Axiom unit tests																			11968
90.41.2 Axiom help page																			11968
$90.41.3 \text{fortran code} \dots$																			11970
$90.41.4 \operatorname{lisp\ code} \dots$																			11974
90.42dlasda																			11974
90.42.1 Axiom unit tests																			11974
90.42.2 Axiom help page																			11974
$90.42.3 \text{fortran code} \dots$																			11978
$90.42.4 \operatorname{lisp\ code}$																			11983
90.43dlasdq																			11983
90.43.1 Axiom unit tests																			11983
90.43.2 Axiom help page																			
90.43.3 fortran code																			
90.43.4 lisp code																			11990
90.44dlasdt																			11990
90.44.1 Axiom unit tests																			11990
90.44.2 Axiom help page																			11990
90.44.3 fortran code																			11991
90.44.4 lisp code																			11993
90.45dlaset																			11993
90.45.1 Axiom unit tests																			11993
90.45.1 Axiom unit tests 90.45.2 Axiom help page																			11993
20.40.2 Axiom neip page	•	•	٠	•	•	•	 •	•	•	 •	 •	 •	•	 •	•	•	 •	•	11333

90.46dlasr	 11997
90.46.1 Axiom unit tests	 11997
$90.46.2\mathrm{Axiom\ help\ page}$	 11997
90.46.3 fortran code	 12000
90.46.4 lisp code	 12004
90.47dlassq	 12005
90.47.1 Axiom unit tests	 12005
90.47.2 Axiom help page	 12005
$90.47.3 \text{fortran code} \dots \dots$	 12006
$90.47.4 \text{lisp code} \dots \dots$	 12007
90.48dlasv2	 12008
90.48.1 Axiom unit tests	 12008
90.48.2 Axiom help page	 12008
90.48.3 fortran code	 12010
90.48.4 lisp code	 12013
90.49dsecnd	 12014
90.49.1 Axiom unit tests	 12014
90.49.2 Axiom help page	 12014
90.49.3 fortran code	 12014
90.49.4 lisp code	 12014
90.50ieeeck	 12015
90.50.1 Axiom unit tests	 12015
90.50.2 Axiom help page	 12015
90.50.3 fortran code	 12016
90.50.4 lisp code	 12018
90.51iladlc	 12019
90.51.1 Axiom unit tests	 12019
90.51.2 Axiom help page	 12019
90.51.3 fortran code	 12020
90.51.4 lisp code	 12021
90.52iladlr	 12022
90.52.1 Axiom unit tests	 12022
90.52.2 Axiom help page	 12022
$90.52.3 \text{fortran code} \dots \dots$	 12023
$90.52.4 \text{lisp code} \dots \dots$	 12024
90.53ilaenv	 12025
90.53.1 Axiom unit tests	 12025
$90.53.2\mathrm{Axiom\ help\ page}$	 12025
$90.53.3 \text{fortran code} \dots \dots$	 12027
90.53.4 lisp code	 12036
90.54ilaver	 12037
90.54.1 Axiom unit tests	 12037
$90.54.2\mathrm{Axiom\ help\ page}$	 12037
$90.54.3 \text{fortran code} \dots \dots$	 12038

$90.54.4 \operatorname{lisp\ code}$	 				 						12038
90.55iparmq	 				 						12039
90.55.1 Axiom unit tests	 				 						12039
90.55.2 Axiom help page	 				 						12039
90.55.3 fortran code	 				 						12042
$90.55.4 \operatorname{lisp\ code}$	 				 						12046
90.56lsame	 				 						12049
90.56.1 Axiom unit tests	 				 						12049
90.56.2 Axiom help page	 				 						12049
$90.56.3 \text{fortran code} \dots$	 				 						12050
$90.56.4 \operatorname{lisp\ code} \dots$	 				 						12051
90.57lsamen	 				 						12052
90.57.1 Axiom unit tests	 				 						12052
90.57.2 Axiom help page	 				 						12052
$90.57.3 \text{fortran code} \dots$											
$90.57.4 \operatorname{lisp\ code} \dots$											
90.58second											
90.58.1 Axiom unit tests											
90.58.2 Axiom help page											
90.58.3 fortran code											
90.58.4 lisp code											
90.59sisnan											
90.59.1 Axiom unit tests											
90.59.2 Axiom help page											
90.59.3 fortran code											
90.59.4 lisp code											
90.60slabad											
90.60.1 Axiom unit tests											
90.60.2 Axiom help page											
90.60.3 fortran code											
90.60.4 lisp code											
90.61slacpy											
90.61.1 Axiom unit tests											
90.61.2 Axiom help page											
90.61.3 fortran code											
90.61.4 lisp code											
90.62sladiv											
90.62.1 Axiom unit tests											12065 12065
90.62.2 Axiom help page											12005
90.62.3 fortran code											12000 12067
$90.62.4 \text{ lisp code} \dots$											12070
90.63slae2											12073
90.63.1 Axiom unit tests											12073
90.63.2 Axiom help page											12074
90.63.3 fortran code											12075
$90.63.4 \operatorname{lisp\ code}$	 				 						12077

90.64slaebz	 	 	12078
90.64.1 Axiom unit tests	 	 	12078
90.64.2 Axiom help page	 	 	12078
90.64.3 fortran code	 	 	12082
90.64.4 lisp code	 	 	12089
90.65slaev2	 	 	12098
90.65.1 Axiom unit tests	 	 	12098
90.65.2 Axiom help page	 	 	12098
90.66slag 2 d			
9			
-			
<u> </u>			
-			
90.68slaisnan			
-			
90.69slamc1			
90.70 slamc $2 \dots \dots \dots$			
90.70.1 Axiom unit tests	 	 	12124
$90.70.4 \operatorname{lisp\ code}$	 	 	12125
90.71slamc3	 	 	12126
90.71.1 Axiom unit tests	 	 	12126
90.71.2 Axiom help page	 	 	12126
90.71.3 fortran code	 	 	12127
90.71.4 lisp code	 	 	12127
90.72slamch	 	 	12127
9			
90.73slaneg			
	 	 	0

90.73.1 Axiom unit tests															
90.73.2 Axiom help page															
90.73.3 fortran code															
$90.73.4 \operatorname{lisp\ code}$															
90.74slanst															
90.74.1 Axiom unit tests															
$90.74.2\mathrm{Axiom}$ help page															
90.74.3 fortran code															
$90.74.4 \operatorname{lisp\ code}$															
90.75 slapy $2 \dots \dots \dots \dots$															 12142
90.75.1 Axiom unit tests															
$90.75.2\mathrm{Axiom}$ help page															
90.75.3 fortran code															
90.75.4 lisp code															
90.76 slapy $3 \dots \dots \dots \dots$															 12144
90.76.1 Axiom unit tests															
90.76.2 Axiom help page															 12145
90.76.3 fortran code															 12145
$90.76.4 \operatorname{lisp\ code} \dots \dots$															 12146
90.77slarnv															 12147
90.77.1 Axiom unit tests															 12147
90.77.2 Axiom help page															 12147
90.77.3 fortran code															 12149
$90.77.4 \operatorname{lisp\ code} \dots$															 12150
90.78slarra															 12152
90.78.1 Axiom unit tests															 12152
90.78.2 Axiom help page															 12152
$90.78.3 \text{fortran code} \dots$															 12154
$90.78.4 \operatorname{lisp\ code}$															 12155
90.79slarrb															
90.79.1 Axiom unit tests															 12157
90.79.2 Axiom help page															 12157
90.79.3 fortran code															
$90.79.4 \operatorname{lisp\ code} \dots$															
90.80slarrc															
90.80.1 Axiom unit tests															
90.80.2 Axiom help page															
90.80.3 fortran code															
90.80.4 lisp code															
90.81slarrd															
90.81.1 Axiom unit tests															
90.81.2 Axiom help page															
90.81.3 fortran code															
90.81.4 lisp code															
90.82slarre															
00.82.1 Axiom unit tosts		•	•	 •	•	• •	• •	•	 •	 •	 •	•	•	 •	 12203

$90.82.2\mathrm{Axiom\ help\ page}$.	 	 12203
$90.82.3 \text{fortran code} \dots \dots$	 	 12207
$90.82.4 \operatorname{lisp\ code}$	 	 12218
90.83slarrf	 	 12234
90.83.1 Axiom unit tests .	 	 12234
90.83.2 Axiom help page.	 	 12235
$90.83.3 \text{fortran code} \dots \dots$	 	 12237
$90.83.4 \operatorname{lisp\ code}$	 	 12243
90.84slarrj	 	 12250
90.84.1 Axiom unit tests .		
90.84.2 Axiom help page .	 	 12250
90.84.3 fortran code		
$90.84.4 \operatorname{lisp\ code} \dots \dots$		
90.85slarrk		
90.85.1 Axiom unit tests .		
90.85.2 Axiom help page .		
90.85.3 fortran code		
90.85.4 lisp code		
90.86slarrr		
90.86.1 Axiom unit tests .		
90.86.2 Axiom help page .		
90.86.3 fortran code		
90.86.4 lisp code		
90.87slartg		
90.87.1 Axiom unit tests .		
90.87.2 Axiom help page .		
90.87.3 fortran code		
90.87.4 lisp code		
90.88slartgp		
90.88.1 Axiom unit tests .		
90.88.2 Axiom help page .		
90.88.3 fortran code		
90.88.4 lisp code		
90.89slaruv		
90.89.1 Axiom unit tests .		
90.89.2 Axiom help page .		
90.89.3 fortran code		
90.89.4 lisp code		
90.90slas2		
90.90.1 Axiom unit tests .		
90.90.2 Axiom help page .		
90.90.3 fortran code		
90.90.4 lisp code		
90.91slascl		
90.91.1 Axiom unit tests .		
90.91.2 Axiom help page .		
oo.or.2 maioni neip page .	 	 12004

90.91.3 fortran code 12306 90.92.4 Lisp code 12316 90.92.1 Axiom unit tests 12316 90.92.2 Axiom help page 12316 90.92.3 fortran code 12318 90.92.4 lisp code 12321 90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12326 90.93.3 fortran code 12329 90.93.4 lisp code 12331 90.94.1 so code 12331 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.94.4 lisp code 12346 90.95.3 so de 12349 90.95.3 Axiom help page 12355 90.95.3 fortran code 12355 90.95.3 fortran code 12359 90.95.4 lisp code 1236 90.96.3 fortran code 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12349 90.97.7 Axiom unit tests 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page																										
90.92.1 Axiom unit tests 12316 90.92.2 Axiom help page 12316 90.92.2 Axiom help page 12318 90.92.3 fortran code 12318 90.92.4 lisp code 12321 90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12326 90.93.3 fortran code 12329 90.93.3 lisp code 12339 90.94.1 Axiom unit tests 12335 90.94.1 Axiom telp page 12335 90.94.1 Axiom telp page 12335 90.94.3 fortran code 12339 90.95.axiom help page 12335 90.95.axiom help page 12355 90.95.5 Axiom help page 12355 90.95.5 Axiom help page 12359 90.95.4 lisp code 12369 90.96.2 Axiom help page 12369 90.96.3 fortran code 12377 90.96.4 Axiom unit tests 12377 90.96.5 Axiom help page 12377 90.96.7 Axiom help page 1249 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12429																										
90.92.1 Axiom unit tests 12316 90.92.2 Axiom help page 12316 90.92.3 fortran code 12321 90.93.8 lasd 12326 90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12326 90.93.3 fortran code 12329 90.93.3 fortran code 12329 90.93.4 lisp code 12331 90.94 lascode 12335 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.1 Axiom unit tests 12335 90.94.3 fortran code 12339 90.94.3 fortran code 12339 90.95.8 lasd3 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12339 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12359 90.95.4 lisp code 12359 90.95.4 lisp code 12359 90.95.4 lisp code 12359 90.96.3 fortran code 12359 90.96.3 fortran code 12359 90.96.3 fortran code 12377 90.96.1 Axiom unit tests 12377 90.96.2 Axiom help page 12375 90.97.3 lisp code 12377 90.97.3 fortran code 12377 90.96.4 lisp code 12377 90.97.3 fortran code 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12427 90.98.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12427 90.98.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12423 90.98.3 fortran code 12423 90.98.4 lisp code 12423 90.98.4 lisp code 12423 90.98.5 Axiom help page 12420 90.97.3 fortran code 12423 90.98.5 Axiom help page 12420 90.97.3 fortran code 12423 90.99.8 Axiom help page 12420 90.97.3 fortran code 12423 90.99.3 fortran code 12433 90.99.3 fortran code 12434 90.99.3 fortran code 12435		1																								
90.92.2 Axiom help page 12316 90.92.3 fortran code 12318 90.92.4 lisp code 12321 90.93.slasd1 12326 90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12329 90.93.3 fortran code 12339 90.94.1 kaxiom unit tests 12335 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.94.3 low thelp page 12335 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12368 90.95.4 lisp code 12369 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12379 90.97.3 Axiom help page 12419 90.97.3 fortran code 12419 90.97.3 fortran code 12429 90.98.3 fortran code 12427 90.98.2 Axiom help page 12427 90.98.3 fortran																										
90.92.3 fortran code 12318 90.92.4 lisp code 12321 90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12326 90.93.3 fortran code 12329 90.93.4 lisp code 12331 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.94.4 lisp code 12336 90.95.8 lasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12377 90.96.3 fortran code 12377 90.96.4 lisp code 12374 90.97.9 Axiom unit tests 12419 90.97.1 Axiom unit tests 12419 90.97.3 fortran code 12420 90.98.1 Axiom unit tests 12420 90.98.2 Axiom help page 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12438 90.99.3 fortran																										
90.92.4 lisp code 12321 90.93.slasd1 12326 90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12326 90.93.3 fortran code 12329 90.94.3 lisp code 12335 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12336 90.95.9 lasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12368 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12374 90.96.3 fortran code 12375 90.96.4 lisp code 12379 90.97.3 fortran code 12394 90.97 slasd5 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12429 90.98.1 Axiom unit tests 12429 90.98.2 Axiom help page 12427 90.98.3 fortran code 12427 90.98.4 lisp code 12438 90.99.9 Axiom help page																										
90.93.slasd1 12326 90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12326 90.93.3 fortran code 12329 90.94.4 lisp code 12331 90.94.2 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.95.1 Axiom unit tests 12355 90.95.1 Axiom help page 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12368 90.96.3 sold 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12374 90.97.2 Axiom unit tests 12419 90.97.2 Axiom unit tests 12419 90.97.3 fortran code 12420 90.98.1 Axiom unit tests 12420 90.98.2 Axiom help page 12427 90.98.3 fortran code 12427 90.98.4 lisp code 1243 90.99.9 slortran code 1243 90.99.3 fortran code </td <td></td> <td>90.92.3 fortran code</td> <td></td> <td>12318</td>		90.92.3 fortran code																								12318
90.93.1 Axiom unit tests 12326 90.93.2 Axiom help page 12326 90.93.3 fortran code 12331 90.94.lasode 12335 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.94.4 lisp code 12346 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12368 90.96.3 fortran code 12374 90.96.1 Axiom unit tests 12377 90.96.3 fortran code 12377 90.96.4 lisp code 12379 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12429 90.97.3 fortran code 12429 90.98.1 Axiom unit tests 12429 90.98.2 Axiom help page 12427 90.98.3 fortran code 12434 90.99.3 fortran code 12439 90.99.1 Axiom unit tests 12439 90.99.2 Axiom help page 12439 90.99.3 fo		$90.92.4 \operatorname{lisp\ code}$														 										12321
90.93.2 Axiom help page 12326 90.93.3 fortran code 12329 90.93.4 lisp code 12331 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12336 90.95.1 Axiom unit tests 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12375 90.96.3 fortran code 12377 90.96.3 fortran code 12377 90.97.8d5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.98.1 Axiom unit tests 12429 90.98.2 Axiom help page 12427 90.98.3 fortran code 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12439 90.99.3 fortran code 12439 90.99.3 fortran code 12439 90.99.3 fortran cod	9	90.93slasd1														 										12326
90.93.3 fortran code 12329 90.93.4 lisp code 12331 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.94.4 lisp code 12346 90.95slasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96.63 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12375 90.96.4 lisp code 12379 90.97.1 Axiom unit tests 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.98.8lasd6 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12427 90.98.3 fortran code 12432 90.99.3 fortran code 12432 90.99.1 Axiom unit tests 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page<		90.93.1 Axiom unit tests																								12326
90.94.slasd2 12335 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.94.4 lisp code 12346 90.95slasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12375 90.96.3 fortran code 12375 90.97.91 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12420 90.97.4 lisp code 12420 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.1 Axiom unit tests 12439 90.99.1 Axiom unit tests 12439 90.99.1 Axiom unit tests 12439 90.99.2 Axiom help page 12439 90.99.3 for		90.93.2 Axiom help page														 										12326
90.94slasd2 12335 90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.95.1 Asiom unit tests 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12377 90.96.2 Axiom help page 12377 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97 slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12420 90.97.4 lisp code 12420 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.1 Axiom unit tests 12439 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code		$90.93.3 \text{fortran code} \dots$														 										12329
90.94.1 Axiom unit tests 12335 90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.95.1 klisp code 12346 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97.3 koim help page 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.98.3 softran code 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.3 sortran code 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.3 klisp code 12439 90.99.3 fortran co		$90.93.4 \operatorname{lisp\ code}$																								12331
90.94.2 Axiom help page 12335 90.94.3 fortran code 12339 90.95.1 Alisp code 12346 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12368 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12377 90.97.3 sortran code 12379 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.98.1 Axiom unit tests 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.3 fortran code 12439 90.99.3 fortran code 12449 90.99	9	90.94 slasd $2 \dots \dots \dots$														 										12335
90.94.3 fortran code 12339 90.94.4 lisp code 12346 90.95slasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12358 90.95.3 fortran code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12429 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.8.4 lisp code 12438 90.99.9.9.9.3 fortran code 12438 90.99.1 Axiom unit tests 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.3 fortran code 12439 90.99.4 lisp code 12456 <td></td> <td>90.94.1 Axiom unit tests</td> <td></td> <td> </td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>12335</td>		90.94.1 Axiom unit tests														 										12335
90.94.3 fortran code 12339 90.94.4 lisp code 12346 90.95slasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12358 90.95.3 fortran code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12429 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.8.4 lisp code 12438 90.99.9.9.9.3 fortran code 12438 90.99.1 Axiom unit tests 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.3 fortran code 12439 90.99.4 lisp code 12456 <td></td> <td>90.94.2 Axiom help page</td> <td></td> <td> </td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>12335</td>		90.94.2 Axiom help page														 										12335
90.95slasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12420 90.97.4 lisp code 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.8 ode 12438 90.99.9 J Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.3 fortran code 12439 90.99.4 lisp code 12448 90.100 Axiom unit tests 12455																										
90.95slasd3 12355 90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12420 90.97.4 lisp code 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.8 ode 12438 90.99.9 J Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.3 fortran code 12439 90.99.4 lisp code 12448 90.100 Axiom unit tests 12455		$90.94.4 \operatorname{lisp\ code}$														 										12346
90.95.1 Axiom unit tests 12355 90.95.2 Axiom help page 12355 90.95.3 fortran code 12368 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12427 90.98.slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.3 fortran code 12427 90.98.3 fortran code 12432 90.99.4 lisp code 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.9 Alisp code 12448 90.100 Blasd8 12455 90.100 Axiom help page 12455 90.100 Axiom help page 12455	9	-																								
90.95.2 Axiom help page 12355 90.95.3 fortran code 12368 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.98.laxiom tests 12427 90.98.laxiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.4 lisp code 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.3 fortran code 12449 90.100 Axiom unit tests 12455 90.100 Axiom help page 12455 90.100 Axiom help page																										
90.95.3 fortran code 12358 90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.2 Axiom unit tests 12419 90.97.3 fortran code 12420 90.97.4 lisp code 12421 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.98.4 lisp code 12434 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.100 Axiom unit tests 12445 90.100 Axiom unit tests 12455 90.100 Axiom help page 12455 90.100 Axiom help page 12456																										
90.95.4 lisp code 12363 90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.1 Axiom unit tests 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.3 fortran code 12439 90.99.4 lisp code 12442 90.99.9 Alisp code 12442 90.106 lasd8 12455 90.100 laxiom unit tests 12455 90.100 laxiom help page 12456																										
90.96slasd4 12374 90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12437 90.98.3 fortran code 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.4 lisp code 12439 90.99.4 lisp code 12448 90.100 lasd8 12455 90.100 lAxiom unit tests 12455 90.100 laxiom help page 12455 90.100 laxiom help page 12456																										
90.96.1 Axiom unit tests 12374 90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.4 lisp code 12442 90.100lasd8 12455 90.100.1xiom unit tests 12455 90.100.2xiom help page 12456	9	-																								
90.96.2 Axiom help page 12375 90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97 slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.3 fortran code 12432 90.99.4 lisp code 12434 90.99slasd7 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12438 90.99.4 lisp code 12442 90.99.4 lisp code 12448 90.100 Axiom unit tests 12455 90.100 Axiom help page 12455 90.100 Axiom help page 12456																										
90.96.3 fortran code 12377 90.96.4 lisp code 12394 90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.4 lisp code 12434 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12438 90.99.3 fortran code 12442 90.99.4 lisp code 12442 90.99.4 lisp code 12448 90.100 lasd8 12455 90.100 Axiom unit tests 12455 90.100 Axiom help page 12456																										
90.96.4 lisp code 12394 90.97 slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.4 lisp code 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.108 lasd8 12455 90.100 Axiom unit tests 12455 90.100 Axiom help page 12456																										
90.97slasd5 12419 90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.4 lisp code 12434 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100.4xiom unit tests 12455 90.100.4xiom help page 12456																										
90.97.1 Axiom unit tests 12419 90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.8.4 lisp code 12434 90.99.9 laxiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100.4xiom unit tests 12455 90.100.2xiom help page 12456	(-																								
90.97.2 Axiom help page 12420 90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.99.4 lisp code 12434 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12442 90.106lasd8 12455 90.100.1Axiom unit tests 12455 90.100.2Axiom help page 12456																										
90.97.3 fortran code 12421 90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.98.4 lisp code 12434 90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.100 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456																										
90.97.4 lisp code 12423 90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.98.4 lisp code 12434 90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.100 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456																										
90.98slasd6 12427 90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.98.4 lisp code 12434 90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456																										
90.98.1 Axiom unit tests 12427 90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.98.4 lisp code 12434 90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456		-																								
90.98.2 Axiom help page 12427 90.98.3 fortran code 12432 90.98.4 lisp code 12434 90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456																										
90.98.3 fortran code 12432 90.98.4 lisp code 12434 90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456																										
90.98.4 lisp code 12434 90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456		1 1 0																								
90.99slasd7 12438 90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106lasd8 12455 90.100.1 Axiom unit tests 12455 90.100.2 Axiom help page 12456																										
90.99.1 Axiom unit tests 12438 90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100. Axiom unit tests 12455 90.100. Axiom help page 12456		-																								
90.99.2 Axiom help page 12439 90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106lasd8 12455 90.100.1 Axiom unit tests 12455 90.100.2 Axiom help page 12456																										
90.99.3 fortran code 12442 90.99.4 lisp code 12448 90.106 lasd8 12455 90.100.1 Axiom unit tests 12455 90.100.2 Axiom help page 12456																										
90.99.4 lisp code 12448 90.100 lasd8 12455 90.100. Axiom unit tests 12455 90.100. xiom help page 12456																										
90.10@lasd8																										
90.100. Axiom unit tests																										
90.100.2Axiom help page	•																									
		90.100.24xiom neip page	•	•	•	•	•	•	•	•	•	•	•	•	•	 •	•	 ٠	•	• •	• •	•	•	• •	•	12450

90.100.4isp code	L
90.10 s lasda	3
90.101. Axiom unit tests	3
90.101.2Axiom help page	3
90.101. 3 ortran code	2
90.101.4isp code	;
90.10 2 lasdq	3
90.102. Axiom unit tests	
90.102.2Axiom help page)
90.102. 3 ortran code	
90.102.4isp code	
90.10 8 lasdt	
90.103. Axiom unit tests	
90.103.2Axiom help page	2
90.103. 3 ortran code	
90.103.4isp code	
90.10slaset	
90.104. Axiom unit tests	
90.104.2Axiom help page	
90.104. 3 ortran code	
90.104.4isp code	
90.10\$\text{lasp code} \tag{12510}	
90.105.Axiom unit tests	
90.105.2Axiom help page	
90.105.3ortran code	
90.105.4isp code	
90.106lassq	
90.106.Axiom unit tests	
90.106.2Axiom help page	
90.106. Sortran code	
90.106.4isp code	
90.10s/lasv2	
90.107.Axiom unit tests	
90.107. Axiom help page	
90.107.3crtran code	
90.107.301tran code	
90.107.4isp code	
90.108.1Axiom unit tests	
90.108.24xiom help page	
90.108. Sortran code	
90.108.4isp code	
90.10 9 erbla_array	
90.109. Axiom unit tests	
90.109.24xiom help page	
90.109. 3 ortran code	
90.109.4isp code)

90.110bbcsd - CS Decomposit	ion of	. Uı	nita	ry I	Mati	rix .							 	12546
90.110. Axiom unit tests													 	12546
90.110.2Axiom help page													 	12547
90.110.3ortran code													 	12551
90.110.4isp code													 	12579
90.11&bdsqr - compute singula	ır val	ues	fro	m a	n S	VD							 	12624
90.111. Axiom unit tests													 	12624
90.111.2Axiom help page													 	12625
90.111.3ortran code													 	12628
90.111.4isp code													 	12651
90.112gbbrd - reduce complex	band	l m	atri	x to	rea	ıl up	per	bid	iago	ona	l.		 	12671
90.112. Axiom unit tests													 	12671
90.112.2Axiom help page													 	12671
90.112.3ortran code													 	12674
90.112.4isp code													 	12688
90.11 d bdsdc													 	12703
90.113. Axiom unit tests													 	12703
90.113.2Axiom help page													 	12703
90.113.3ortran code													 	12707
90.113.4isp code													 	12719
90.11 4 bdsqr													 	12731
90.114. Axiom unit tests													 	12731
90.114.2Axiom help page													 	12731
90.114.3ortran code													 	12734
90.114. 4 isp code													 	12758
90.11 ā disna													 	12778
90.115. Axiom unit tests													 	12778
90.115.2Axiom help page													 	12778
90.115.3ortran code													 	12780
90.115.4isp code													 	12785
90.11 6 gebak													 	12787
90.116. Axiom unit tests													 	12787
90.116.2Axiom help page													 	12788
90.116. 3 ortran code													 	12789
90.116.4isp code													 	12795
90.11 7 gebal														
90.117. Axiom unit tests													 	12799
90.117.2Axiom help page													 	12799
90.117.3ortran code													 	12801
90.117.4isp code														
90.11 8 gebd2														
90.118. Axiom unit tests														
90.118.2Axiom help page														
90.118. 3 ortran code														
90.118.4isp code														
00.11flgobrd														12827

90.119.3xortran code 12836 90.119.4isp code 12835 90.12dgeev 12840 90.120.Axiom unit tests 12840 90.120.Axiom help page 12840 90.120.Sarran code 12842 90.120.Sarran code 12854 90.12disp code 12854 90.12disp code 12855 90.12disp code 12856 90.12d.Axiom unit tests 12868 90.12l.Axiom help page 12868 90.12l.Axiom help page 12868 90.12l.Sarran code 12872 90.12l.Sip code 12886 90.12l.Sip code 12886 90.12l.Sip code 12869 90.12l.Sip code 12869 90.12disp code 12869 90.12disp code 12869 90.12disp code 12890 90.12disphd2 12902 90.12disphd2 12902 90.12disphd 12909 90.12disphd	90.119. Axiom unit tests													
90.119.4isp code 12835 90.120.exiom unit tests 12840 90.120.2xiom help page 12840 90.120.3cortran code 12842 90.120.disp code 12845 90.121.disp code 12868 90.121.Mxiom unit tests 12868 90.121.Axiom help page 12868 90.121.Axiom help page 12872 90.121.disp code 12872 90.122.disp code 12886 90.122.disp code 12802 90.122.Axiom unit tests 12902 90.122.Axiom help page 12902 90.122.Axiom help page 12907 90.123.Axiom help page 12907 90.123.Axiom help page 12909 90.123.Axiom help page 12909 90.123.Axiom help page 12911 90.124.Gip code 12911 90.124.Gip code 12918 90.124.Axiom unit tests 12923 90.124.Axiom help page 12923 90.124.Axiom help page 12923 90.125.Axiom help page 12929 90.125.Axiom help page 12929 90.125.Axiom help page <	90.119.2Axiom help page													12827
90.12d geev 12840 90.120. Axiom unit tests 12840 90.120. Zxiom help page 12842 90.120. Jortran code 12842 90.12d geevx 12868 90.121. Axiom unit tests 12868 90.121. Axiom help page 12868 90.121. Axiom telp page 12872 90.121. Axiom unit tests 12872 90.122. Axiom unit tests 12902 90.122. Axiom help page 12904 90.122. Axiom help page 12907 90.123. Axiom unit tests 12909 90.123. Axiom unit tests 12909 90.123. Axiom unit tests 12909 90.123. Axiom help page 12909 90.124. Axiom unit tests 12919 90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Axiom help page 12923 90.124. Axiom help page 12925 90.125. Axiom help page 12929 90.126. By code 12927 90.126. Axiom unit tests 12929 90.126. Axiom help page 12939 90.126. Axiom help page 12939	90.119.3ortran code													12830
90.120.Axiom unit tests 12840 90.120.3ortran code 12842 90.120.disp code 12854 90.12digeevx 12868 90.12d.Axiom unit tests 12868 90.121.Axiom belp page 12868 90.121.3ortran code 12872 90.121.disp code 12886 90.122.disp code 12802 90.122.Axiom unit tests 12902 90.122.Axiom help page 12902 90.122.Axiom tests 12902 90.122.Axiom unit tests 12907 90.123.disp code 12907 90.123.Axiom unit tests 12909 90.123.Axiom help page 12909 90.123.Axiom help page 12911 90.123.disp code 12911 90.124.gelq2 1293 90.124.sylom help page 12923 90.124.sylom help page 12923 90.124.sylom help page 12923 90.124.fylom unit tests 12923 90.125.Axiom help page 12929 90.125.Axiom help page 12929 90.125.Axiom help page 12939 90.126.Axiom help page 1293	90.119.4isp code													12835
90.120. Axiom help page 12840 90.120. Jortran code 12842 90.120. Jisp code 12868 90.121. Axiom unit tests 12868 90.121. Axiom help page 12868 90.121. Jortran code 12872 90.121. Jisp code 12886 90.122. Jisp code 12802 90.122. Axiom help page 12902 90.122. Jisp code 12902 90.122. Jisp code 12902 90.123. Jisp code 12907 90.123. Jisp code 12909 90.123. Axiom help page 12909 90.123. Jortran code 12911 90.123. Jortran code 12911 90.124. Jisp code 12911 90.124. Jisp code 12918 90.124. Jisp code 12918 90.124. Jisp code 12923 90.124. Jisp code 12923 90.124. Jisp code 12923 90.125. Jisp code 12925 90.126. Jisp code 12929 90.125. Jisp code 12939 90.126. Jisp code 12939 90.126. Jisp code 12939 9	90.12 d geev								 					12840
90.120. Jisp code 12842 90.120. Jisp code 12854 90.12d Jespecox 12868 90.121. Axiom unit tests 12868 90.121. Jortran code 12872 90.121. Jisp code 12886 90.121. Jisp code 12886 90.122. Jisp code 12902 90.122. Axiom lelp page 12902 90.122. Jisp code 12902 90.122. Jisp code 12904 90.123. Jisp code 12907 90.123. Jisp code 12909 90.123. Jisp code 12909 90.123. Jisp code 12909 90.124. Jisp code 12911 90.124. Jisp code 12911 90.124. Jisp code 12913 90.124. Jisp code 12923 90.124. Jisp code 12923 90.124. Jisp code 12927 90.125. Jisp code 12927 90.126. Jisp code 12931 90.125. Jisp code 12931 90.125. Jisp code 12931 90.126. Jisp code 12939 90.126. Jisp code 12939 90.126. Jisp code <	90.120. Axiom unit tests													12840
90.120.lisp code 12854 90.121.degeevx 12868 90.121.Axiom unit tests 12868 90.121.Jortran code 12872 90.121.disp code 12886 90.122.disp code 12896 90.122.Axiom unit tests 12902 90.122.Axiom help page 12902 90.122.Jortran code 12904 90.122.disp code 12907 90.123.disp code 12909 90.123.Axiom help page 12909 90.123.Axiom help page 12909 90.123.Axiom help page 12918 90.124.disp code 12918 90.124.disp code 12918 90.124.disp code 12918 90.124.disp code 12923 90.124.disp code 12923 90.124.disp code 12925 90.125.Axiom help page 12929 90.125.Axiom unit tests 12929 90.125.Axiom unit tests 12929 90.125.Axiom help page 12939 90.126.Axiom unit tests 12939 90.126.Axiom help page 12939 90.126.Axiom help page 12939	90.120.2Axiom help page													12840
90.124 legevx 12868 90.121. Axiom unit tests 12868 90.121. Axiom help page 12872 90.121. Jortran code 12872 90.121. Jisp code 12886 90.122. Backed 12902 90.122. Axiom unit tests 12902 90.122. Axiom help page 12902 90.122. Jisp code 12904 90.123. By code 12907 90.123. Axiom unit tests 12909 90.123. Axiom help page 12909 90.123. Jisp code 12911 90.123. Jisp code 12911 90.124. Axiom help page 12913 90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Axiom help page 12923 90.124. Axiom unit tests 12925 90.125. Axiom help page 12927 90.126. Jisp code 12927 90.126. Axiom unit tests 12929 90.125. Axiom help page 12939 90.126. Axiom unit tests 12939 90.126. Axiom unit tests 12939 90.126. Axiom unit tests 12939 90.126. Axio	90.120.3ortran code													12842
90.121. Axiom unit tests 12868 90.121. 3ortran code 12872 90.121. 4isp code 12886 90.122 gehd2 12902 90.122. Axiom unit tests 12902 90.122. Axiom help page 12902 90.122. 3ortran code 12904 90.122. 4isp code 12907 90.123. 4xiom unit tests 12909 90.123. 4xiom unit tests 12909 90.123. 5ortran code 12911 90.123. 3ortran code 12911 90.123. 4isp code 12911 90.124. 4isp code 12918 90.124. 90 129.12 90.124. 90 129.12 90.124. 90 129.12 90.124. 90 129.12 90.124. 90 129.12 90.124. 90 129.12 90.124. 90 129.12 90.124. 90 129.12 90.125. 90 129.12 90.126. 90 129.12 90.127. 90 129.12 90.128. 90 129.12 90.129. 90 129.13 90.120. 90 129.14 90.120. 90 <td>90.120.4isp code</td> <td></td> <td>12854</td>	90.120.4isp code													12854
90.121. Axiom help page 12868 90.121. Jisp code 12872 90.121. Jisp code 12886 90.122. Axiom unit tests 12902 90.122. Axiom help page 12902 90.122. Jortran code 12902 90.122. Jisp code 12907 90.123. Axiom unit tests 12909 90.123. Axiom help page 12909 90.123. Axiom help page 12909 90.123. Axiom help page 12911 90.123. Axiom help page 12918 90.124. Axiom unit tests 12918 90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Axiom help page 12923 90.124. Axiom help page 12925 90.125. Axiom help page 12927 90.126. Axiom unit tests 12929 90.125. Axiom help page 12939 90.126. Axiom unit tests 12939 90.127. Axiom unit tests 12945 90.127. Axiom help page 12945	90.12dgeevx								 					12868
90.121.Jortran code 12872 90.121.disp code 12886 90.122.Behd2 12902 90.122.Axiom unit tests 12902 90.122.Axiom help page 12902 90.122.Jortran code 12904 90.122.Jortran code 12907 90.123.Bxiom unit tests 12909 90.123.Axiom help page 12909 90.123.Jortran code 12911 90.124.Jaisp code 12918 90.124.Bxiom unit tests 12923 90.124.Axiom help page 12923 90.124.Jaisp code 12923 90.124.Jaisp code 12927 90.124.Bisp code 12927 90.125.Axiom help page 12929 90.125.Axiom help page 12929 90.125.Axiom help page 12939 90.125.Axiom help page 12939 90.126.Axiom help page 12941 90.127.Axiom help page 12945 90.127.Axiom help page	90.121. Axiom unit tests								 					12868
90.121.4isp code 12886 90.122.gehd2 12902 90.122.Axiom unit tests 12902 90.122.Axiom help page 12902 90.122.Xortran code 12904 90.122.disp code 12907 90.123.gehrd 12909 90.123.Axiom unit tests 12909 90.123.Axiom help page 12909 90.123.Jortran code 12911 90.123.Jortran code 12918 90.124.gelq2 12923 90.124.Axiom unit tests 12923 90.124.Axiom help page 12923 90.124.Axiom help page 12925 90.124.Jisp code 12925 90.125.Axiom unit tests 12929 90.125.Axiom help page 12929 90.125.Axiom help page 12931 90.126.geqr2 12931 90.126.Axiom help page 12939 90.126.Axiom help page 12939 90.126.Axiom help page 12945 90.127.Axiom help page 12945 90.127.Axiom help page 12945 90.127.Axiom help page 12945 90.127.Axiom help page 12945	90.121.2Axiom help page								 					12868
90.128 gehd2 12902 90.122. Axiom unit tests 12902 90.122. Sortran code 12904 90.122. Jortran code 12907 90.128 deshrd 12909 90.123. Axiom unit tests 12909 90.123. Axiom help page 12909 90.123. Jortran code 12911 90.123. Jortran code 12918 90.124 gelq2 12923 90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Axiom code 12925 90.124. Axiom help page 12927 90.125. gelqf 12929 90.125. Axiom unit tests 12929 90.125. Axiom help page 12931 90.125. Axiom help page 12931 90.126. geqr2 12936 90.126. Axiom help page 12939 90.126. Axiom help page 12939 90.126. Axiom help page 12945 90.127. Axiom help page <td>90.121.3ortran code</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td> </td> <td></td> <td></td> <td></td> <td></td> <td>12872</td>	90.121.3ortran code								 					12872
90.122. Axiom unit tests 12902 90.122. Axiom help page 12904 90.122. Jortran code 12907 90.122. Jisp code 12907 90.123 gehrd 12909 90.123. Axiom unit tests 12909 90.123. Axiom help page 12909 90.123. Jisp code 12911 90.124. Jisp code 12918 90.124. Exiom unit tests 12923 90.124. Axiom help page 12923 90.124. Jortran code 12925 90.124. Jisp code 12925 90.124. Jisp code 12927 90.125. Axiom help page 12929 90.125. Jortran code 12929 90.125. Jortran code 12931 90.125. Jisp code 12931 90.126. Axiom help page 12936 90.126. Axiom help page 12939 90.126. Axiom help page 12939 90.126. Axiom help page 12941 90.127. Axiom help page 12945 90.127. Axiom help page 12945 90.127. Axiom help page 12945 90.127. Jisp code 12947 90.127. Jisp code	90.121.4isp code								 					12886
90.122. Axiom help page 12902 90.122. Jortran code 12904 90.122. Lisp code 12907 90.123 leptrd 12909 90.123. Axiom unit tests 12909 90.123. Axiom help page 12909 90.123. Jortran code 12911 90.123. Jisp code 12918 90.124 gelq2 12923 90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Jortran code 12925 90.124. Jortran code 12927 90.125. Axiom unit tests 12929 90.125. Jortran code 12931 90.125. Jortran code 12931 90.126 eqr2 12939 90.126 Axiom help page 12939 90.126. Axiom help page 12939 90.126. Axiom help page 12939 90.126. Axiom help page 12941 90.127. Axiom help page 12945 90.127. Axiom help page 12945 90.127. Axiom help page 12945 90.127. Jortran code 12945 90.127. Jortran code 12947 90.127. Jortran code	90.12 2 gehd2								 					12902
90.122.3ortran code 12904 90.123.pc code 12907 90.123.gehrd 12909 90.123.Axiom unit tests 12909 90.123.Xxiom help page 12909 90.123.Sortran code 12911 90.123.4isp code 12918 90.124.gelq2 12923 90.124.Axiom unit tests 12923 90.124.3ortran code 12923 90.124.3isp code 12925 90.124.4isp code 12927 90.125.Axiom unit tests 12929 90.125.Axiom help page 12929 90.125.Axiom help page 12939 90.125.Jisp code 12931 90.126.Exxiom help page 12936 90.126.Exxiom help page 12939 90.126.Exxiom help page 12939 90.126.Exxiom help page 12939 90.127.Exxiom help page 12945 90.127.fisp code 129	90.122. Axiom unit tests								 					12902
90.123.4isp code 12907 90.123.gehrd 12909 90.123.Axiom unit tests 12909 90.123.Axiom help page 12909 90.123.Jortran code 12918 90.124.sip code 12918 90.124.gelq2 12923 90.124.Axiom unit tests 12923 90.124.Axiom help page 12923 90.124.Jortran code 12925 90.124.Jisp code 12927 90.125.Axiom help page 12929 90.125.Axiom help page 12939 90.125.Jisp code 12931 90.126.peqr2 12936 90.126.Axiom unit tests 12939 90.126.Axiom help page 12939 90.126.Jisp code 12941 90.126.Jiviom help page 12949 90.127.Axiom help page 12945 90.127.Axiom help page 12945 90.127.Syrtran code 12945 90.127.fixiom help page 12945	90.122.2Axiom help page													12902
90.123 ehrd 12909 90.123. Axiom unit tests 12909 90.123. Exiom help page 12909 90.123. Sortran code 12911 90.123. Hisp code 12918 90.124 eglq2 12923 90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Jortran code 12925 90.124. Jortran code 12927 90.126 gelqf 12927 90.126 gelgf 12929 90.125. Axiom unit tests 12929 90.125. Jortran code 12931 90.125. Jortran code 12931 90.126. Axiom unit tests 12939 90.126. Axiom unit tests 12939 90.126. Axiom help page 12939 90.126. Axiom unit tests 12939 90.126. Axiom help page 12941 90.127. Axiom help page 12945 90.127. Axiom help pa	90.122.3ortran code													12904
90.123. Axiom unit tests 12909 90.123. Axiom help page 12909 90.123. Fortran code 12911 90.123. Aisp code 12918 90.124 gelq2 12923 90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Jortran code 12925 90.124. Jortran code 12927 90.126 gelqf 12929 90.125. Axiom unit tests 12929 90.125. Jortran code 12931 90.126 geqr2 12931 90.126 geqr2 12939 90.126 Axiom unit tests 12939 90.126 Jortran code 12941 90.127 Axiom help page 12943 90.127 geqrf 12945 90.127 Axiom unit tests 12945 90.127 Axiom help page 12945 90.127 Axiom help page 12945 90.127 Jortran code 12947 90.128 gesdd 12952 <td>90.122.4 isp code</td> <td></td> <td>12907</td>	90.122.4 isp code													12907
90.123. Axiom help page 12909 90.123. Fortran code 12911 90.124. Isip code 12918 90.124. Rxiom unit tests 12923 90.124. Axiom help page 12923 90.124. Sortran code 12925 90.124. Sortran code 12927 90.125. Get 12927 90.125. Axiom unit tests 12929 90.125. Sortran code 12931 90.125. Sortran code 12931 90.126. Axiom help page 12939 90.126. Axiom unit tests 12939 90.126. Axiom help page 12939 90.126. Axiom help page 12939 90.126. Axiom help page 12941 90.126. Axiom help page 12945 90.127. Axiom unit tests 12945 90.127. Axiom help page 12945 90.127. Axiom help page 12945 90.127. Axiom help page 12945 90.127. Fortran code 12947 90.127. Sortran code 12947 90.128 gesdd 12952	90.12 d gehrd													12909
90.123.3ortran code 12918 90.124.gelq2 12923 90.124.Axiom unit tests 12923 90.124.Axiom help page 12923 90.124.3ortran code 12925 90.124.4isp code 12927 90.12delqf 12929 90.125.Axiom unit tests 12929 90.125.Axiom help page 12929 90.125.Jortran code 12931 90.125.4isp code 12936 90.126deger2 12939 90.126.Axiom unit tests 12939 90.126.Axiom help page 12939 90.126.Axiom help page 12941 90.126.Axiom help page 12943 90.127.Axiom help page 12945 90.127.Axiom unit tests 12945 90.127.Axiom help page 12945 90.127.Byrotran code 12947 90.127.Byrotran code 12947 90.128.gesdd 12952	90.123. Axiom unit tests								 					12909
90.123.4isp code 12918 90.124.gelq2 12923 90.124.Axiom unit tests 12923 90.124.Axiom help page 12923 90.124.Jortran code 12925 90.124.Jisp code 12927 90.125.Jaxiom unit tests 12929 90.125.Axiom help page 12929 90.125.Jortran code 12931 90.125.Jisp code 12931 90.126.geqr2 12939 90.126.Axiom unit tests 12939 90.126.Axiom help page 12939 90.126.Axiom help page 12941 90.126.Axiom unit tests 12941 90.127.Axiom help page 12945 90.127.Axiom unit tests 12945 90.127.Axiom help page 12945 90.127.Bytran code 12947 90.128.gesdd 12952	90.123.2Axiom help page													12909
90.124 gelq2 12923 90.124 Axiom unit tests 12923 90.124 Axiom help page 12925 90.124 Jortran code 12925 90.124 Jegelqf 12927 90.125 Axiom unit tests 12929 90.125 Axiom help page 12929 90.125 Jortran code 12931 90.125 Jisp code 12931 90.126 geqr2 12939 90.126 Axiom unit tests 12939 90.126 Jortran code 12941 90.126 Jisp code 12943 90.127 Axiom help page 12945 90.127 Axiom unit tests 12945 90.127 Axiom help page 12945 90.127 Axiom help page 12945 90.127 Jortran code 12947 90.127 Jisp code 12952 90.128 gesdd 12955	90.123.3ortran code								 					12911
90.124. Axiom unit tests 12923 90.124. Axiom help page 12923 90.124. Fortran code 12925 90.124. Aisp code 12927 90.125. Axiom unit tests 12929 90.125. Axiom help page 12929 90.125. Axiom help page 12931 90.125. Aisp code 12931 90.126. Axiom unit tests 12939 90.126. Axiom unit tests 12939 90.126. Axiom help page 12939 90.126. Fortran code 12941 90.127. Axiom unit tests 12943 90.127. Axiom unit tests 12945 90.127. Axiom help page 12945 90.127. Axiom help page 12945 90.127. Axiom help page 12947 90.127. Fortran code 12947 90.127. Fortran code 12947 90.128 gesdd 12952	90.123.4 isp code													12918
90.124. Axiom help page 12923 90.124. Fortran code 12925 90.124. Jisp code 12927 90.125 gelqf 12929 90.125. Axiom unit tests 12929 90.125. Jortran code 12931 90.125. Jisp code 12931 90.126 deqr2 12939 90.126 Axiom unit tests 12939 90.126. Axiom help page 12939 90.126. Jortran code 12941 90.126. Jisp code 12943 90.127. Axiom unit tests 12945 90.127. Axiom help page 12945 90.127. Jortran code 12945 90.127. Jortran code 12947 90.127. Jisp code 12947 90.128 gesdd 12952	90.12 4 gelq2								 					12923
90.124. 3ortran code 12925 90.124. 4isp code 12927 90.125 gelqf 12929 90.125. Axiom unit tests 12929 90.125. 3ortran code 12931 90.125. 4isp code 12931 90.126 geqr2 12936 90.126 Axiom unit tests 12939 90.126. 3ortran code 12939 90.126. 4isp code 12941 90.126. 4isp code 12943 90.127. Axiom unit tests 12945 90.127. Axiom help page 12945 90.127. 3ortran code 12947 90.127. 4isp code 12947 90.127. 4isp code 12952 90.128 gesdd 12952	90.124. Axiom unit tests								 					12923
90.124.4isp code 12927 90.12dgelqf 12929 90.125.Axiom unit tests 12929 90.125.Zxiom help page 12929 90.125.Jortran code 12931 90.125.Aisp code 12936 90.126.geqr2 12939 90.126.Axiom unit tests 12939 90.126.Zxiom help page 12939 90.126.Jortran code 12941 90.12dgeqrf 12943 90.12dgeqrf 12945 90.127.Axiom unit tests 12945 90.127.Jortran code 12945 90.127.Jortran code 12947 90.127.Jiortran code 12947 90.127.Jisp code 12952 90.128gesdd 12955	90.124.2Axiom help page													12923
90.12dgelqf1292990.125.Axiom unit tests1292990.125.Axiom help page1292990.125.Sortran code1293190.125.4isp code1293690.12dgeqr21293990.126.Axiom unit tests1293990.126.Axiom help page1293990.126.Sortran code1294190.12dspeqrf1294390.12dgeqrf1294590.127.Axiom unit tests1294590.127.Sortran code1294590.127.Sortran code1294590.127.Sortran code1294790.127.disp code1294790.128gesdd12952	90.124.3ortran code													12925
90.125. Axiom unit tests1292990.125. Axiom help page1292990.125. Fortran code1293190.125. Isip code1293690.126 geqr21293990.126. Axiom unit tests1293990.126. Axiom help page1293990.126. Fortran code1294190.126. Fortran code1294390.127. Axiom unit tests1294590.127. Axiom unit tests1294590.127. Axiom help page1294590.127. Fortran code1294790.127. Fortran code1294790.127. Sortran code1294790.127. Sortran code1295290.128 gesdd12955	90.124.4isp code													12927
90.125. Axiom help page1292990.125. Fortran code1293190.125. Aisp code1293690.126 geqr21293990.126. Axiom unit tests1293990.126. Fortran code1294190.126. Fortran code1294190.126. Aisp code1294390.127. Axiom unit tests1294590.127. Axiom help page1294590.127. Axiom help page1294590.127. Fortran code1294790.127. Fortran code1294790.127. Sortran code1294790.128 gesdd12952	90.12 d gelqf								 					12929
90.125.3ortran code1293190.125.4isp code1293690.126geqr21293990.126.1Axiom unit tests1293990.126.2Axiom help page1293990.126.3ortran code1294190.126.4isp code1294390.127.1Axiom unit tests1294590.127.1Axiom unit tests1294590.127.2Axiom help page1294590.127.3ortran code1294790.127.4isp code1295290.128gesdd12955	90.125. Axiom unit tests								 					12929
90.125.4isp code1293690.126.geqr21293990.126.Axiom unit tests1293990.126.Axiom help page1293990.126.Fortran code1294190.126.4isp code1294390.127.Axiom unit tests1294590.127.Axiom help page1294590.127.Axiom help page1294590.127.Fortran code1294790.127.4isp code1295290.128gesdd12955	90.125.2Axiom help page													12929
90.126.geqr2 12939 90.126.Axiom unit tests 12939 90.126.Axiom help page 12939 90.126.Fortran code 12941 90.126.4isp code 12943 90.127 degeqrf 12945 90.127.Axiom unit tests 12945 90.127.Axiom help page 12945 90.127.Fortran code 12947 90.127.4isp code 12952 90.128desdd 12955	90.125.3ortran code								 					12931
90.126.Axiom unit tests1293990.126.2Axiom help page1293990.126.3fortran code1294190.126.4isp code1294390.127dgeqrf1294590.127.Axiom unit tests1294590.127.2Axiom help page1294590.127.3fortran code1294790.127.4isp code1295290.128gesdd12955														
90.126.2Axiom help page1293990.126.3ortran code1294190.126.4isp code1294390.127dgeqrf1294590.127.4Axiom unit tests1294590.127.2Axiom help page1294590.127.3ortran code1294790.127.4isp code1295290.128gesdd12955	90.12 d geqr2								 					12939
90.126. Fortran code 12941 90.126. Fisp code 12943 90.127 Igeqrf 12945 90.127. Axiom unit tests 12945 90.127. Axiom help page 12945 90.127. Fortran code 12947 90.127. Iges code 12952 90.128 gesdd 12955	90.126. Axiom unit tests													12939
90.126.4isp code 12943 90.127dgeqrf 12945 90.127.Axiom unit tests 12945 90.127.Axiom help page 12945 90.127.Fortran code 12947 90.127.4isp code 12952 90.128dgesdd 12955	90.126.2Axiom help page													12939
90.12 degerf 12945 90.127. Axiom unit tests 12945 90.127. Axiom help page 12945 90.127. Intrancode 12947 90.127. is p code 12952 90.128 gesdd 12955	90.126.3ortran code													12941
90.127. Axiom unit tests 12945 90.127. Axiom help page 12945 90.127. Fortran code 12947 90.127. is p code 12952 90.128 gesdd 12955	90.126.4isp code													12943
90.127.2Axiom help page 12945 90.127.3fortran code 12947 90.127.4isp code 12952 90.128gesdd 12955	90.12 dgeqrf								 					12945
90.127.3ortran code	90.127. Axiom unit tests													12945
90.127.4isp code <td>90.127.2Axiom help page</td> <td></td> <td>12945</td>	90.127.2Axiom help page													12945
90.128gesdd	90.127.3ortran code													12947
90.128gesdd														12952
														12955
	90.128. Axiom unit tests													12955

90.128.24xiom help page	
90.128.3ortran code	
90.128.4isp code	
90.12 d gesvd	
90.129. Axiom unit tests	
90.129.2Axiom help page	
90.129. 3 ortran code	13077
90.129.4isp code	
90.13 d gesv	13320
90.130. Axiom unit tests	
90.130.2Axiom help page	13321
90.130. 3 ortran code	13322
90.130.4isp code	
90.13dgetf2	13325
90.131. Axiom unit tests	13325
90.131.2Axiom help page	13326
90.131. 3 ortran code	13327
90.131.4isp code	13331
90.13 2 getrf	13333
90.132. Axiom unit tests	13333
90.132.2Axiom help page	13333
90.132.3ortran code	
90.132.4isp code	13339
90.13 d getrs	
90.133. Axiom unit tests	
90.133.2Axiom help page	
90.133. 3 ortran code	
90.133.4isp code	
90.13 4 hseqr	
90.134.Axiom unit tests	
90.134.2Axiom help page	
90.134. 3 ortran code	
90.134.4isp code	
90.13 d isnan	
90.135.Axiom unit tests	
90.135.2Axiom help page	
90.135.3ortran code	
00.40% 31	13371
•	13372
	13372
	13372
110	13373
	13374
	13375
	13375
	13375
00.101.41A10H Help page	T0010

90.137. 3 ortran code	13378
90.137.4isp code	13384
90.138lacon	13397
90.138. Axiom unit tests	13397
90.138.2Axiom help page	13397
90.138. 3 ortran code	13399
90.138.4isp code	13405
90.13 d lacpy	13408
90.139. Axiom unit tests	13408
90.139.2Axiom help page	13408
90.139. 3 ortran code	13410
90.139.4isp code	13412
90.14dladiv	13413
90.140. Axiom unit tests	13413
90.140.2Axiom help page	13413
90.140. 3 ortran code	
90.140.4isp code	
90.14dlaed6	
90.141. Axiom unit tests	
90.141.2Axiom help page	
90.141. 3 ortran code	
90.141.4isp code	
90.142dlaexc	
90.142. Axiom unit tests	
90.142.2Axiom help page	
90.142. 3 ortran code	
90.142.4isp code	
90.14dlahqr	
90.143. Axiom unit tests	
90.143.2\(\text{Axiom help page}\)	
90.143.3ortran code	
90.143.4isp code	
90.14dlahrd DEPRECATED see dlahr2	
90.144. Axiom unit tests	
90.144.2\(\text{Axiom help page}\)	
90.144. 3 ortran code	
90.144.4isp code	
90.14dajsnan	
90.145.Axiom unit tests	
90.145.2\(\text{Axiom help page}\)	
90.145.3ortran code	
	13499 13499
*	13499 13500
	13500
90.146. Axiom help page	
90.146.3 ortran code	
90.140.a0FtFaH code	τ 9903

90.146.4isp code														13510
90.147dlamch														13524
90.147. Axiom unit tests														13524
90.147.2Axiom help page														13524
90.147.3ortran code														13525
90.147.4isp code														13527
90.148lamc1														13530
90.148. Axiom unit tests														
90.148.2Axiom help page														
90.148.3ortran code														
90.148.4isp code														
90.14@lamc2														13536
90.149. Axiom unit tests														13536
90.149.2Axiom help page														
90.149.3ortran code														
90.149.4isp code														
90.15dlamc3														
90.150. Axiom unit tests														
90.150.2Axiom help page														13545
90.150.3ortran code														13546
90.150.4isp code														13547
90.15dlamc4														
90.151. Axiom unit tests														13547
90.151.2Axiom help page														
90.151.3ortran code														13548
90.151.4isp code														13550
90.15 2 lamc5														13551
90.152. Axiom unit tests														13551
90.152.2Axiom help page														
90.152.3ortran code														13552
90.152.4isp code														13555
90.15 d lamrg														13556
90.153. Axiom unit tests														13556
90.153.2Axiom help page														13556
90.153.3ortran code														13557
90.153.4isp code														13559
90.15 d lange														13560
90.154. Axiom unit tests														13560
90.154.2Axiom help page														13560
90.154.3ortran code														13562
90.154.4isp code														13564
90.15 d lanhs														13566
90.155. Axiom unit tests														13566
90.155.2Axiom help page														13567
90.155.3ortran code														13568
00 155 Jisp code														13570

90.15 d lanst	 	 	 	 	. 13573
90.156. Axiom unit tests	 	 	 	 	. 13573
90.156.2Axiom help page	 	 	 	 	. 13574
90.156.3 ortran code	 	 	 	 	. 13575
90.156. 4 isp code					
90.157dlanv2	 	 	 	 	. 13579
90.157. Axiom unit tests					
90.157.2Axiom help page					
90.157. 3 ortran code					
90.157.4isp code					
90.158lapy2					
90.158. Axiom unit tests					
90.158.24xiom help page					
90.158. 3 ortran code					
90.158.4isp code					
90.15@lapy3					
90.159.Axiom unit tests					
90.159.24xiom help page					
90.159.3 ortran code					
90.159.4isp code					
90.16dlagtr					
90.160.Axiom unit tests					
90.160.24xiom help page					
90.160.3 ortran code					
90.160.4isp code					
90.16dlarfb					
90.161. Axiom unit tests					
90.161.24xiom help page					
90.161.3 ortran code					
90.161.4isp code					
90.162 larfg					
90.162. Axiom unit tests					
90.162.2Axiom help page					
90.162.3 ortran code					
90.162.4isp code					
90.16 d larf					
90.163. Axiom unit tests					
90.163.2Axiom help page					
1 1 0					
90.163. 3 ortran code					
90.163.4isp code					
90.16 d larft					
90.164. Axiom unit tests					
90.164.24 Xiom help page					
90.164. Sortran code					
90.164.4isp code					
90.16 d larfx	 	 	 	 	. 13674

90.165. Axiom unit tests											
90.165.2Axiom help page											
90.165.3ortran code			 	 		 					13676
90.165.4isp code			 	 							13687
90.16 d lartg			 	 							13711
90.166. Axiom unit tests			 	 							13711
90.166.2Axiom help page			 	 		 					13712
90.166.3ortran code			 	 					 		13713
90.166.4isp code			 	 					 		13715
90.16 d las2											
90.167. Axiom unit tests			 	 		 					13716
90.167.2Axiom help page			 	 					 		13717
90.167. 3 ortran code											
90.167.4isp code											
90.16 8 lascl											
90.168. Axiom unit tests			 	 		 					13721
90.168.2Axiom help page			 	 		 					13721
90.168. 3 ortran code											
90.168.4isp code											
90.16@lasd0											
90.169. Axiom unit tests											
90.169.2Axiom help page			 	 					 		13732
90.169. 3 ortran code											
90.169.4isp code			 	 							13737
90.17 d lasd1											
90.170. Axiom unit tests			 	 					 		13742
90.170.2Axiom help page			 	 							13742
90.170. 3 ortran code											
90.170.4isp code			 	 					 		13747
90.17 d lasd2											
90.171. Axiom unit tests			 	 							13750
90.171.2Axiom help page			 	 							13750
90.171. 3 ortran code											
90.171.4isp code			 	 					 		13761
90.17 2 lasd3			 	 							13769
90.172. Axiom unit tests			 	 							13769
90.172.2Axiom help page			 	 							13769
90.172. 3 ortran code			 	 					 		13772
90.172.4isp code			 	 					 		13777
90.17 d lasd4			 	 					 		13787
90.173. Axiom unit tests			 	 					 		13787
90.173.2Axiom help page											13788
90.173. 3 ortran code											13790
90.173.4isp code											13805
90.17 4 lasd5			 	 							13830
00 174 1\(\text{xiom unit tosts}\)											13830

90.174.2Axiom help page	
90.174. 3 ortran code	13832
90.174.4isp code	13834
90.17 d lasd6	13838
90.175. Axiom unit tests	13838
90.175.2Axiom help page	13838
90.175. 3 ortran code	13842
90.175.4isp code	13845
90.17 d lasd7	13848
90.176. Axiom unit tests	13848
90.176.2Axiom help page	13848
90.176. 3 ortran code	
90.176.4isp code	
90.17 d lasd8	13864
90.177.1Axiom unit tests	
90.177.2Axiom help page	13864
90.177. 3 ortran code	
90.177.4isp code	
90.178llasda	
90.178.1Axiom unit tests	
90.178.2\(\text{Axiom help page}\)	
90.178.3ortran code	
90.178.4isp code	
90.17@lasdq	
90.179.1Axiom unit tests	
90.179. A xiom help page	
90.179. 3 ortran code	
90.179.4isp code	
90.18 d lasdt	
90.180.1Axiom unit tests	
90.180.2Axiom help page	13908
90.180. 3 ortran code	
90.180.4isp code	
90.18dlaset	
90.181. Axiom unit tests	13912
90.181. Axiom help page	
90.181. 3 ortran code	
90.181.4isp code	
90.18 2 lasq1	
90.182.1Axiom unit tests	
90.182. Axiom help page	
90.182. 3 ortran code	
90.182.4isp code	
90.18 d lasq2	
90.183.1Axiom unit tests	
90.183.2Axiom help page	

90.183.3ortran code																										13925
90.183.4isp code																										
90.18 4 lasq3																										
90.184. Axiom unit tests																										13950
90.184.2Axiom help page																										13951
90.184.3ortran code																										13952
90.184.4isp code																				 						13957
90.18 d lasq4																				 						13966
90.185. Axiom unit tests																				 						13966
90.185.2Axiom help page																				 						13966
90.185.3ortran code																				 						13967
90.185.4isp code																										13973
90.18 d lasq5																				 						13980
90.186. Axiom unit tests																				 						13980
90.186.2Axiom help page																				 						13980
90.186. 3 ortran code																										
90.186.4isp code																				 						13985
90.187dlasq6																										13996
90.187. Axiom unit tests																										
90.187.2Axiom help page																				 						13996
90.187. 3 ortran code																										
90.187.4isp code																										14000
90.18 8 lasr																										
90.188. Axiom unit tests																										
90.188.2Axiom help page																										
90.188. 3 ortran code																										
90.188.4isp code																										
90.18@lasrt																										
90.189. Axiom unit tests																										
90.189.2Axiom help page																										
90.189. 3 ortran code																										
90.189.4isp code																										
90.19dlassq																										
90.190. Axiom unit tests																										
90.190.2Axiom help page																										
90.190. 3 ortran code																										
90.190.4isp code																										
90.19dlasv2																										
90.191. Axiom unit tests																										14037
90.191.2Axiom help page																										14037
90.191. 3 ortran code																										
90.191.4isp code																										
90.19 2 laswp																										
90.192. Axiom unit tests																										
90.192.2 Axiom help page																										
00 102 Fortran code	•	•	٠	•	٠	٠	•	•	•	•	-	- '	•	•	-	 ·	•	-	•	 •	٠	٠	•	•	-	14046

90.192.4isp code			 														14047
90.19 d lasy2			 					 									14049
90.193. Axiom unit tests			 														14049
90.193.2Axiom help page			 					 									14049
90.193. 3 ortran code																	
90.193. 4 isp code																	
90.19 4 org2r																	
90.194. Axiom unit tests																	
90.194.24xiom help page																	
90.194. 3 ortran code																	
90.194.4isp code																	
90.19 d orgbr																	
90.195.Axiom unit tests																	
90.195.24xiom help page																	
90.195. 3 ortran code																	
90.195.4isp code																	
90.19 6 orghr																	
90.196. Axiom unit tests																	
90.196.2Axiom help page																	
90.196.3 ortran code																	
90.196.4isp code																	
90.197dorgl2																	
90.197. Axiom unit tests																	
90.197. Axiom unit tests 90.197. Axiom help page																	
90.197.24xion neip page																	
90.197.4isp code																	
90.198 orglq																	
90.198.Axiom unit tests																	
90.198. Axiom help page																	
90.198. Sortran code																	
90.198.4isp code																	
90.199. Axiom unit tests																	
90.199.2\(\text{Axiom help page}\)																	
90.199. 3 ortran code																	
90.199.4isp code																	
90.20dorm2r																	
90.200. Axiom unit tests	-	-	 	-	-	-	 -	 	-	 -	 -	-	-	 -	-	 -	
90.200.2Axiom help page																	
90.200. 3 ortran code																	
90.200.4isp code																	
90.20dormbr																	14119
90.201. Axiom unit tests																	14119
90.201. Axiom help page																	14119
90.201. 3 ortran code																	
90.201.4isp code			 					 									14125

90.20 2 orml2												 14130
90.202. Axiom unit tests												 14130
90.202.2Axiom help page												 14130
90.202. 3 ortran code												 14132
90.202.4isp code												 14135
90.20 d ormlq												 14137
90.203. Axiom unit tests												 14137
90.203.2Axiom help page												 14137
90.203. 3 ortran code												 14139
90.203.4isp code												 14143
90.20 d ormgr												 14146
90.204. Axiom unit tests												
90.204.2Axiom help page												
90.204. 3 ortran code												
90.204.4isp code												
90.20 a trevc												
90.205. Axiom unit tests												
90.205.2Axiom help page												
90.205.3ortran code												
90.205.4isp code												
90.20 d trexc												
90.206.Axiom unit tests												
90.206.2Axiom help page												
90.206.3 ortran code												
90.206.4isp code												
90.20dtrsna												
90.207. Axiom unit tests												
90.207. Axiom telp page												
90.207. Sortran code												
90.207.4isp code												
90.20% eeeck												
90.208. Axiom unit tests												
90.208. Axiom help page												
90.208.3 ortran code												
90.208.4isp code												
90.20¶aenv												
90.209. Axiom unit tests												
90.209.24xiom help page												
90.209. 3 ortran code												14253
90.209.4isp code												14262
90.21 d azlc												14268
90.210. Axiom unit tests												14268
90.210.24xiom help page												14268
90.210. 3 ortran code												14269
90.210.4isp code												 14270
00.21 flagle												1/1971

	90.211. Axiom unit tests															14271
	90.211.2Axiom help page									 						14271
	90.211.3ortran code															14272
	90.211.4isp code															14273
9	90.21 2 gebak									 						14274
	90.212. Axiom unit tests															14274
	90.212.2Axiom help page									 						14275
	90.212. 3 ortran code															
	90.212.4isp code															
9	90.21 3 gebal															
	90.213. Axiom unit tests															
	90.213.2Axiom help page															
	90.213. 3 ortran code															
	90.213.4isp code															
9	90.21 4 geev															
	90.214. Axiom unit tests															
	90.214.2Axiom help page															
	90.214. 3 ortran code															
	90.214.4isp code															
	90.215gehd2															
	90.215.Axiom unit tests															
	90.215.2Axiom help page															
	90.215. 3 ortran code															
	90.215.4isp code															
	90.216 hseqr															
•	90.216.Axiom unit tests															
	90.216.24xiom help page															
	90.216.3 ortran code															
	90.216.4isp code															
	90.217 dagy															
•	90.217.Axiom unit tests															
	90.217. Axiom tillt tests 90.217. Axiom help page															
	90.217.24xioni neip page 90.217.36ortran code															
	90.217.4isp code															
•	90.218lacpy															
	90.218. Axiom unit tests															
	90.218.24xiom help page															
	90.218. 3 ortran code															
	90.218.4isp code															14344
	90.21 9 ladiv															14346
	90.219. Axiom unit tests															14346
	90.219.24xiom help page															14346
	90.219. 3 ortran code															14347
	90.219.4isp code															14348
9	90.22 0 lahqr		•										•	•	 •	
	90 220 Axiom unit tests															14348

90.220.2Axiom help page	
90.220.3ortran code	
90.220.4isp code	
90.22 1 lahr2	
90.221. Axiom unit tests	
90.221.2Axiom help page	
90.221. 3 ortran code	14373
90.221.4isp code	14376
90.222 lange	14381
90.222. Axiom unit tests	14381
90.222.2Axiom help page	14382
90.222. 3 ortran code	14383
90.222.4isp code	14385
90.223laqr0	14388
90.223. Axiom unit tests	
90.223.2Axiom help page	14389
90.223.3ortran code	
90.223.4isp code	
90.22 4 lagr1	
90.224.Axiom unit tests	
90.224.2Axiom help page	
90.224.3ortran code	
90.224.4isp code	
90.225lagr2	
90.225.Axiom unit tests	
90.225.2Axiom help page	
90.225.3ortran code	
90.225.4isp code	
90.226lagr3	
90.226.Axiom unit tests	
90.226.2Axiom help page	
90.226.3ortran code	
90.226.4isp code	
90.227laqr4	
90.227. Axiom unit tests	
90.227.2Axiom help page	
90.227.3ortran code	
90.227.4isp code	
	14481
	14481
11.0	14482
	14485
	14498
	14529
	14529
90.229.2Axiom help page	14530

90.229.3ortran code
90.229.4isp code
90.23\(\rho\)larf \(
90.230. Axiom unit tests
90.230.2Axiom help page
90.230. 3 ortran code
90.230.4isp code
90.23 z larfg
90.231. Axiom unit tests
90.231.2Axiom help page
90.231. 3 ortran code
90.231.4isp code
90.23 2 larft
90.232. Axiom unit tests
90.232.2Axiom help page
90.232.3ortran code
90.232.4isp code
90.23 3 lartg
90.233. Axiom unit tests
90.233.2Axiom help page
90.233. 3 ortran code
90.233.4isp code
90.23 4 lascl
90.234. Axiom unit tests
90.234.2Axiom help page
90.234. 3 ortran code
90.234.4isp code
90.23 5 laset
90.235. Axiom unit tests
90.235.2Axiom help page
90.235.3ortran code
90.235.4isp code
90.236lassq
90.236. Axiom unit tests
90.236.2Axiom help page
90.236. 3 ortran code
90.236.4isp code
90.23 7 latrs
90.237. Axiom unit tests
90.237.2Axiom help page
90.237. 3 ortran code
90.237.4isp code
90.23\(\text{grot}\)
90.238. Axiom unit tests
90.238.2Axiom help page
90.238. 3 ortran code

90.238.4 isp code													14653
90.239trevc													14654
90.239. Axiom unit tests													14654
90.239.2Axiom help page													14654
90.239.3ortran code													14658
90.239.4isp code													14663
90.24\text{\text{d}}trexc													14672
90.240. Axiom unit tests													14672
90.240.2Axiom help page													14672
90.240.3ortran code													14674
90.240.4isp code													14677
90.24 ½ ung2r													14679
90.241. Axiom unit tests													14679
90.241.2Axiom help page													14679
90.241.3ortran code													14681
90.241.4isp code													14683
90.24 2 unghr													14684
90.242. Axiom unit tests													14684
90.242.2Axiom help page													14685
90.242.3ortran code													14686
90.242.4isp code													14689
90.24 3 ungqr													14691
90.243. Axiom unit tests													14691
90.243.2Axiom help page													14692
90.243.3ortran code													14694
90.243.4isp code													14697
90.24 4 unm2r													14701
90.244. Axiom unit tests													14701
90.244.2Axiom help page													14701
90.244.3ortran code													14704
90.244.4isp code													14706
90.24 5 unmhr													14708
90.245. Axiom unit tests													14708
90.245.2Axiom help page													14709
90.245.3ortran code													14711
90.245.4isp code													14714
90.24 6 unmqr													14716
90.246. Axiom unit tests													14716
90.246.2Axiom help page													14717
90.246.3ortran code													14719
90.246.4isp code													14723

14729

91 LAPACK tests

92 ISAAC Secure Random Number Generation	14743
92.0.5 Axiom help page	14743
92.0.6 defstruct isaacCtx	14745
92.0.7 defun generateNextIsaacBlock	14747
92.0.8 defun rand $32 \dots \dots \dots \dots \dots \dots \dots \dots \dots$	14748
92.0.9 defun randBits	14748
$92.0.10\mathrm{defmacro\ incfWrap}32\ldots\ldots\ldots$	14748
92.0.11 defmacro mix	14749
$92.0.12 defun scramble \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	14751
$92.0.13 \mathrm{defun}$ init KernelSeed	14752
92.0.14 defun initCommonLispRandomSeed	14752
$92.0.15 \mathrm{defun} \mathrm{initNullSeed} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	14753
93 Chunk collections	14755
Bibliography	14765
Index	14775

Volume 11: Axiom Browser

1	Overview	1
	Build Instructions	1
	The Makefile	1
	Building new pages	2
	Communicating with Axiom	3
	Handling statements with no free variables	3
	Handling statements with free variables	3
	Handling domain database lookups	4
	Handling)show domain	4
	Handling lisp expressions	4
	Handling expressions that have no output	4
	Defined Pages	4
		15
	·	16
		16
		18
	· ·	21
		22
		22
		$\frac{1}{23}$
		$\frac{1}{24}$
		25
		$\frac{-6}{26}$
		38
		82
		82
		83
		84
		87
		88
		88
		95
		96
		96
	•	98
	calculus.xhtml	
	calculuspage.xhtml	
	calderivatives.xhtml	
	calintegrals.xhtml	-
	callaplace.xhtml	
	callimits.xhtml	
	calmoreintegrals.xhtml	
	calseries vhtml	

CONTENTS	355

calseries1.xhtml
calseries2.xhtml
calseries3.xhtml
calseries4.xhtml
calseries5.xhtml
calseries6.xhtml
calseries7.xhtml
calseries8.xhtml
cats.xhtml
commandline.xhtml
complexlimit.xhtml
conversionfunctions.xhtml
crytopage.xhtml
crytoclass1.xhtml
crytoclass2.xhtml
crytoclass3.xhtml
crytoclass4.xhtml
crytoclass5.xhtml
crytoclass6.xhtml
crytoclass7.xhtml
crytoclass8.xhtml
crytoclass9.xhtml
crytoclass10.xhtml
crytoclass11.xhtml
dbopbinary.xhtml
dbcharacteristic.xhtml
dbcomplex.xhtml
dbcomplexconjugate.xhtml
dbcomplexfactor.xhtml
dbcomplexdoublefloat.xhtml
dbcomplexfloat.xhtml
dbcompleximag.xhtml
dbcomplexnorm.xhtml
dbcomplexreal.xhtml
dbcomplexinteger.xhtml
dbexpressioninteger.xhtml
dbfractioninteger.xhtml
dbfractionpolynomialinteger.xhtml
dblookup.xhtml
dbopacos.xhtml
dbopacosh.xhtml
dbopacot.xhtml
dbopacoth.xhtml
dbopacsc.xhtml
dbopacsch.xhtml
dbopaddmod.xhtml

dbopairyai.xhtml	196
dbopairybi.xhtml	196
${\bf dbop approximants.xhtml} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	196
dbopasin.xhtml	
dbopasinh.xhtml	197
dbopasec.xhtml	197
dbopasech.xhtml	197
${\bf dbopatan.xhtml} \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	197
$\label{eq:dbopatanh.xhtml} dbopatanh.xhtml \ \dots $	198
${\bf dbopber noullib.xhtml} \dots \dots \dots \dots \dots \dots \dots \dots \dots $	
${\it dbopbesseli.xhtml} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	
${\bf dbopbesselj.xhtml} $	
${\bf dbopbesselk.xhtml} $	
${\bf dbopbessely.xhtml} $	199
${\bf dbopbeta.xhtml} \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	199
${\bf dbopcardinal number.xhtml} \dots $	199
$\label{eq:decomposition} dbop cheby shevt. xhtml \ \dots $	200
dbopchebyshevu.xhtml	200
${\bf dbopcoefficient.xhtml} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$	200
dbopcoefficients.xhtml	200
dbopcoerce.xhtml	201
dbopcolumn.xhtml	201
dbopcompactfraction.xhtml	201
dbopcomplexeigenvectors.xhtml	201
dbopcomplexelementary.xhtml	202
dbopcomplexintegrate.xhtml	
dbopcomplexlimit.xhtml	202
dbopcomplexsolve.xhtml	
dbopcontent.xhtml	
dbopcontinuedfraction.xhtml	203
dbopconvergents.xhtml	203
dbopconvert.xhtml	203
dbopcopy.xhtml	204
dbopcos.xhtml	204
dbopcosh.xhtml	204
dbopcot.xhtml	204
dbopcoth.xhtml	205
dbopcount.xhtml	
dbopcountableq.xhtml	205
dbopcreate3space.xhtml	205
dbopcsc.xhtml	206
dbopcsch.xhtml	206
dbopcurve.xhtml	206
dbopcycleragits.xhtml	206
dbopcyclotomic.xhtml	207
dbopd.xhtml	207
450pamium	201

CONTENTS	357
----------	-----

dbopdecimal.xhtml	
dbopdefiningpolynomial.xhtml	
dbopdegree.xhtml	
dbopdenom.xhtml	
dbopdraw.xhtml	
dbopdeterminant.xhtml	
$\label{eq:decomposition} dbop diagonal matrix. xhtml \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	
dbopdigamma.xhtml	
dbopdigits.xhtml	
dbopdimension.xhtml	
dbopdivide.xhtml	
dbopdivisors.xhtml	
dbopei.xhtml	
dbopeigenmatrix.xhtml	
dbopeigenvalues.xhtml	
dbopeigenvector.xhtml	211
dbopeigenvectors.xhtml	211
dbopelt.xhtml	211
dbopequal.xhtml	212
dbopeulere.xhtml	212
${\bf dbopeulerphi.xhtml} \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $	212
dbopeval.xhtml	212
dbopevenq.xhtml	213
dbopexp.xhtml	213
dbopexquo.xhtml	213
dbopfactor.xhtml	213
dbopfactorfraction.xhtml	214
dbopfibonacci.xhtml	214
dbopfiniteq.xhtml	214
dbopfirstdenom.xhtml	214
dbopfirstnumer.xhtml	215
dbopfractragits.xhtml	215
dbopfractionpart.xhtml	215
dbopgamma.xhtml	215
dbopgcd.xhtml	216
dbophermiteh.xhtml	
dbophex.xhtml	216
dbophorizconcat.xhtml	216
dbophtrigs.xhtml	217
dbophypergeometric0f1.xhtml	217
dbopinteger.xhtml	217
dbopintegrate.xhtml	217
dbopinverse.xhtml	218
dbopinvmod.xhtml	218
dbopjacobi.xhtml	218
dboplaguerrel.xhtml	218

dboplaurent.xhtml	
dboplem.xhtml	
dbopleadingcoefficient.xhtml	
dbopleadingmonomial.xhtml	
dboplegendre.xhtml	
dboplength.xhtml	
dboplimit.xhtml	
dboplog.xhtml	
dboploggamma.xhtml	
dbopmainvariable.xhtml	
dbopmakegraphimage.xhtml	
dbopmakeobject.xhtml	
dbopmakeviewport3d.xhtml	
dbopmap.xhtml	22
dbopmapbang.xhtml	22
dbopmatrix.xhtml	22
dbopmax.xhtml	
dbopmemberq.xhtml	23
dbopmin.xhtml	23
dbopminimumdegree.xhtml	23
dbopminus.xhtml	
dbopmoebiusmu.xhtml	24
dbopmonicdivide.xhtml	24
dbopmulmod.xhtml	24
dbopncols.xhtml	
dbopnegativeq.xhtml	25
dbopnew.xhtml	25
dbopnextprime.xhtml	25
dbopnorm.xhtml	26
dbopnrows.xhtml	26
dbopnthfractionalterm.xhtml	26
dbopnthroot.xhtml	26
dbopnumer.xhtml	27
dbopnumeric.xhtml	27
dbopoddq.xhtml	27
dboponedimensionalarray.xhtml	27
dbopoperator.xhtml	
dboporthonormalbasis.xhtml	28
dbopoutputfixed.xhtml	
dbopoutputfloating.xhtml	28
dbopoutputgeneral.xhtml	29
dbopoutputspacing.xhtml	29
dboppadicfraction.xhtml	29
dbopnullity.xhtml	-
dbopnullspace.xhtml	
dbopnumberoffractionalterms.xhtml	
<u>.</u>	-

CONTENTS	3	59

dboppartialfraction.xhtml	230
dboppartialquotients.xhtml	230
dbopplus.xhtml	231
dboppattern.xhtml	231
dboppermanent.xhtml	231
dboppi.xhtml	231
dboppolygamma.xhtml	232
dboppositiveq.xhtml	232
dboppositiveremainder.xhtml	232
dbopprefixragits.xhtml	232
dbopprevprime.xhtml	
dbopprimefactor.xhtml	
dbopprimeq.xhtml	
dbopprimes.xhtml	
dboppuiseux.xhtml	
dbopgelt.xhtml	
dbopqseteltbang.xhtml	
dbopquatern.xhtml	
dbopradicaleigenvectors.xhtml	
dbopradicalsolve.xhtml	
dboprank.xhtml	
dbopratdenom.xhtml	
dboprealeigenvectors.xhtml	
dboprealelementary.xhtml	
dbopreduce.xhtml	
dbopreductum.xhtml	236
dboprem.xhtml	237
dbopquo.xhtml	237
dbopresetvariableorder.xhtml	237
dbopresultant.xhtml	237
${\bf dboproot of.xhtml} \ \dots $	238
${\bf dboprootsimp.xhtml} $	238
dboprootsof.xhtml	
dbopseries.xhtml	
dbopround.xhtml	
dboprow.xhtml	
${\bf dboprowechelon.xhtml} \ \dots $	
dbopsetcolumnbang.xhtml	
1 0	240
dbopsetrowbang.xhtml	240
1	240
	240
1 0	241
1 1 0	241
1	
dbopsin.xhtml	241

dbopsingleintegerand.xhtml
dbopsingleintegernot.xhtml
dbopsingleintegeror.xhtml
dbopsingleintegerxor.xhtml
dbopsec.xhtml
dbopsech.xhtml
dbopsetvariableorder.xhtml
dbopsinh.xhtml
dbopsolve.xhtml
dbopsqrt.xhtml
dbopstar.xhtml
dbopstarstar.xhtml
dbopsubmatrix.xhtml
dbopsubmod.xhtml
dbopsurface.xhtml
dbopsumofkthpowerdivisors.xhtml
dboptan.xhtml
dboptanh.xhtml
dboptaylor.xhtml
dboptimes.xhtml
dboptotaldegree.xhtml
dboptrace.xhtml
dboptranspose.xhtml
dboptrigs.xhtml
dboptruncate.xhtml
dbopvariables.xhtml
dbopvectorise.xhtml
dbopvectorspace.xhtml
dbopwrite.xhtml
dbopzeroof.xhtml
dbopzerosof.xhtml
dbopzerog.xhtml
dbopvertconcat.xhtml
dbopwholepart.xhtml
dbpolynomialinteger.xhtml
dbpolynomialfractioninteger.xhtml
dbopwholeragits.xhtml
definiteintegral.xhtml
ů
dlmfapproximations.xhtml
dlmfasymptoticexpansions.xhtml
dlmfbarnesgfunction.xhtml
dlmfbetafunction.xhtml
dlmfcontinuedfractions.xhtml

CONTENTS	361

dlmfdefinitions.xhtml
dlmffunctionrelations.xhtml
dlmfgraphics.xhtml
dlmfinequalities.xhtml
dlmfinfiniteproducts.xhtml
dlmfintegrals.xhtml
dlmfintegralrepresentations.xhtml
dlmfmathematicalapplications.xhtml
dlmfmethodsofcomputation.xhtml
dlmfmultidimensionalintegral.xhtml
dlmfnotation.xhtml
dlmfphysicalapplications.xhtml
dlmfpolygammafunctions.xhtml
dlmfqgammaandbetafunctions.xhtml
dlmfseriesexpansions.xhtml
dlmfsums.xhtml
dlmfsoftware.xhtml
dlmfspecialvaluesandextrema.xhtml
dlmftables.xhtml
draw.xhtml
draw2donevariable.xhtml
draw2ddefinedcurve.xhtml
draw2dpolynomialequation.xhtml
draw3dtwovariable.xhtml
draw3ddefinedtube.xhtml
draw3ddefinedsurface.xhtml
equdifferential.xhtml
equdifferentiallinear.xhtml
equdifferentialnonlinear.xhtml
equdifferentialpowerseries.xhtml
equationpage.xhtml
equsystemlinear.xhtml
examplesexposedpage.xhtml
factored.xhtml
foundationlibrarydocpage.xhtml
funalgebraicfunctions.xhtml
funelementary functions. xhtml
funoperatoralgebra.xhtml
functionpage.xhtml
funpatternmatching.xhtml
funrational functions.xhtml
funsimplification.xhtml
glossarypage.xhtml
graphexamples.xhtml
graphexamplesassorted.xhtml
graphexamplesimplicit.xhtml
9-wp

graphexampleslistofpoints.xhtml	711
graphexamplesonevariable.xhtml	
graphexamplesparametric.xhtml	714
graphexamplespolar.xhtml	715
graphexamplesthreed.xhtml	
graphicspage.xhtml	
graphviewports.xhtml	718
graph2d.xhtml	720
graph2dimplicit.xhtml	720
graph2dlistsofpoints.xhtml	721
graph2donevariable.xhtml	723
graph2dparametric.xhtml	
graph2dpolar.xhtml	726
graph3d.xhtml	727
graph3dobjects.xhtml	728
graph3dparametric.xhtml	
graph3dsurfaces.xhtml	
graph3dtubeplots.xhtml	
graph3dtwovariables.xhtml	
htxtoppage.xhtml	
indefiniteintegral.xhtml	
introtofloat.xhtml	
jenks.xhtml	
laurentseries.xhtml	
linalgpage.xhtml	742
linconversion.xhtml	
lincreate.xhtml	
lineigen.xhtml	
linhilbert.xhtml	
linintro.xhtml	
linoperations.xhtml	
linpermaent.xhtml	
linsquarematrices.xhtml	
linvectors.xhtml	
lin1darrays.xhtml	
lin2darrays.xhtml	
$\mathrm{man0page.xhtml}$	
menualgebraadjointmatrix.xhtml	776
menualgebraapplytolist.xhtml	776
menualgebracharacteristicpolynomial.xhtml	
menualgebradeterminant.xhtml	
menualgebraeigenvalues.xhtml	
menualgebraeigenvectors.xhtml	
menualgebraentermatrix.xhtml	
menualgebrainvertmatrix.xhtml	
menualgebrageneratematrix.xhtml	

CONTENTS	363
----------	-----

menualgebramakelist.xhtml	
menualgebramaptolist.xhtml	
menualgebramaptomatrix.xhtml	
menualgebrareducelist.xhtml	
menualgebratransposematrix.xhtml	
menuaxiomaddtopath.xhtml)
menuaxiomclearmemory.xhtml)
menuaxiomdeletefunction.xhtml)
menuaxiomdeletevariable.xhtml)
menuaxiominterrupt.xhtml)
menuaxiomrestart.xhtml	-
menuaxiomshowdefinition.xhtml	-
menuaxiomdisplay.xhtml	-
menuaxiomset.xhtml	-
menuaxiomshowfunctions.xhtml	2
menuaxiomshowvariables.xhtml	2
menuaxiomtoggletimedisplay.xhtml	2
menucalculuscalculussum.xhtml	2
menucalculuscalculusproduct.xhtml	3
menucalculuschangevariable.xhtml	3
menucalculuscontinuedfractions.xhtml	3
menucalculusdifferentiate.xhtml	3
menucalculusdividepolynomials.xhtml	Ĺ
menucalculusfindlimit.xhtml	Ĺ
menucalculusgetseries.xhtml	Ĺ
menucalculusgreatestcommondivisor.xhtml	Ĺ
menucalculusleastcommonmultiple.xhtml)
menucalculusintegrate.xhtml)
menucalculusinverselaplacetransform.xhtml	
menucalculuslaplacetransform.xhtml	
menucalculuslevel3.xhtml	j
menucalculuslevel3a.xhtml	j
menucalculuslevel3b.xhtml	
menucalculuslevel3c.xhtml	j
menucalculuspadeapproximation.xhtml	
menucalculuspartialfractions.xhtml	
menucalculusrischintegrate.xhtml	
menueditcopy.xhtml	
menueditcopyasimage.xhtml	
menueditcopytex.xhtml	3
menueditcopytext.xhtml	3
menueditcut.xhtml	3
menueditpaste.xhtml)
menueditdeleteselection.xhtml	
menueditselectiontoimage.xhtml	
menueditselectiontoinput.xhtml	

menuequationsrealrootsofpolynmial.xhtml
menuequationsatvalue.xhtml
menuequationsboundaryvalueproblem.xhtml
menuequationsinitialvalueproblem1.xhtml
menuequationsinitialvalueproblem2.xhtml
menuequationssolvealgebraicsystem.xhtml
menuequationseliminatevariable.xhtml
menuequationssolvelinearsystem.xhtml
menuequationssolveode.xhtml
menuequationssolveodewithlaplace.xhtml
menuequationsrootsofpolynomial.xhtml
menuequationssolve.xhtml
menuequationssolvenumerically.xhtml
menufileexit.xhtml
menufileinputfile.xhtml
menufileloadlibrary.xhtml
menufileopen.xhtml
menufileprint.xhtml
menufileread.xhtml
menufilesave.xhtml
menufilesaveas.xhtml
menufiletogglespool.xhtml
menunumericsetprecision.xhtml
menunumerictobigfloat.xhtml
menunumerictofloat.xhtml
menunumerictogglenumericoutput.xhtml
menusimplifyaddalgebraicequality.xhtml
menusimplifycomplexsimplification.xhtml
menusimplifycontractlogarithms.xhtml
menusimplifyevaluatenounform.xhtml
menusimplifyexpandexpression.xhtml
menusimplifyexpandlogarithms.xhtml
menusimplifyfactorialsandgamma.xhtml
menusimplifyfactorcomplex.xhtml
menusimplifyfactorexpression.xhtml
menusimplifymoduluscomputation.xhtml
menusimplifysimplifyexpression.xhtml
menusimplifysubtitute.xhtml
menusimplifysimplifyradicals.xhtml
menusimplifytogglealgebraicflag.xhtml
menusimplifytrigsimplification.xhtml
numbasicfunctions.xhtml
numberspage.xhtml
numcardinalnumbers.xhtml
numcomplexnumbers.xhtml
numcontinuedfractions.xhtml

CONTENTS	365

numexamples.xhtml
numfactorization.xhtml
$numfinite fields.xhtml \ . \ . \ . \ . \ . \ . \ . \ . \ . \ $
numfloat.xhtml
numfractions.xhtml
numfunctions.xhtml
numgeneralinfo.xhtml
numintegerfractions.xhtml
numintegers.xhtml
nummachinefloats.xhtml
nummachinesizedintegers.xhtml
numnumbertheoreticfunctions.xhtml
numnumericfunctions.xhtml
numoctonions.xhtml
numotherbases.xhtml
numpartialfractions.xhtml
numproblems.xhtml
numquaternions.xhtml
numquotientfields.xhtml
numrationalnumbers.xhtml
numrepeatingbinaryexpansions.xhtml
numrepeatingdecimals.xhtml
numrepeatinghexexpansions.xhtml
numromannumerals.xhtml
ocwmit18085.xhtml
ocwmit18085lecture1.xhtml
ocwmit18085lecture2.xhtml
operations.xhtml
outputfunctions.xhtml
pagelist.xhtml
pagematrix.xhtml
pageonedimensionalarray.xhtml
pageset.xhtml
pagetable.xhtml
pagepermanent.xhtml
pagesquarematrix.xhtml
pagetwodimensionalarray.xhtml
pagevector.xhtml
polybasic functions.xhtml
polyfactorization.xhtml
polyfactorization1.xhtml
polyfactorization2.xhtml
polyfactorization3.xhtml
polyfactorization4.xhtml
polygcdandfriends.xhtml
polynomialpage.xhtml
porynomicapage.xiitiiii

p	plyroots.xhtml	906
p	olyroots1.xhtml	907
p	plyroots2.xhtml	909
p	olyroots3.xhtml	911
p	plyroots4.xhtml	913
p	plyspecifictypes.xhtml	915
p	plyspecifictypes1.xhtml	916
p	plyspecifictypes2.xhtml	926
p	plyspecifictypes3.xhtml	933
p	plyspecifictypes4.xhtml	936
p	olysubstitutions.xhtml	938
p ¹	uiseuxseries.xhtml	940
		941
re		942
re	leasenotes.xhtml	943
ro	otpage.xhtml	944
se	ries.xhtml	946
se	riesexpand.xhtml	947
	olve.xhtml	948
SC	lvelinearequations.xhtml	949
SC	lvelinearmatrix.xhtml	951
SC	lvesinglepolynomial.xhtml	956
SC	lvesystempolynomials.xhtml	957
St	ımmation.xhtml	957
		957
ta	ylorseries.xhtml	958
to	pexamplepage.xhtml	959
to	picspage.xhtml	960
to	preferencepage.xhtml	961
to	psettingspage.xhtml	962
tı	torial.xhtml	962
u	glangpage.xhtml	963
u	gsyscmdpage.xhtml	963
us	sersguidepage.xhtml	963
ro	m3720.input	963
		964
		965
bi	tmaps/axiom1.bitmap	966
License	>	971
Bibliogra	phy	973

Volume 12: Axiom Crystal

Axiom 1.1	Crystal Design Book presentation 1.1.1 Book spines 1.1.2 Linking information			
Experi	ments			
1.2	ments Image: Control of the control			
1.3	Hide/Show a nested div element			
1.4	Hide/Show a ring of elements			
Other	work			
1.5	work Understanding the Dynamics of Complex Lisp Programs [?]			
	Bibliography 9			

Volume 13: Proving Axiom Correct

1	Why this effort will not succeed 1.1 General problems with formal verification	5 11
2	Progress Will Occur	13
3	Here is a problem	15
•	•	15
		15^{-1}
		15
	· -	16
	* -	$17 \\ 17$
		18
	V- V	18
		$\frac{16}{19}$
		19 19
	ÿ .	
		19 19
	U 1 1	20
		$\frac{21}{2}$
		$\frac{23}{24}$
	3.9 Approaches	24
4	Theory	27
	·	28
		$\frac{1}{28}$
5	GCD in Miranda by Broda, et al.	31
6	GCD in COQ	35
7	GCD in Nuprl by Anne Trostle	37
8	Software Details	39
G		39
9	Temporal Logic of Actions (TLA)	41
	- ,	41
		42
		$\frac{1}{42}$
		42
		$\frac{1}{42}$
	•	43
		44
		44

CC	ONTENTS	369
	9.2.2 Checking proofs	. 44
10	O COQ proof of GCD 10.1 Basics of the Calculus of Constructions 10.1.1 Terms 10.1.2 Judgements 10.1.3 Inference Rules 10.1.4 Defining Logical Operators 10.1.5 Defining Types 10.2 Why does COQ have Prop?	47 . 47 . 47 . 48 . 48 . 49 . 49
11	10.3 Source code of COQ GCD Proof	
	LEAN proof of GCD Formal Pre- and Post-conditions	59 67
	3 Types and Signatures	67 69
14	COQ nat vs Axiom NNI 14.0.1 Library Coq.Init.Nat	73 . 73
15	Binary Power in COQ by Casteran and Sozeau 15.1 On Monoids 15.1.1 Classes and Instances 15.1.2 A generic definition of power 15.1.3 Instance Resolution 15.2 More Monoids 15.2.1 Matrices over some ring 15.3 Reasoning within a Type Class 15.3.1 The Equivalence Proof 15.3.2 Some Useful Lemmas About power 15.3.3 Final Steps 15.3.4 Discharging the Context 15.3.5 Subclasses	. 81 . 82 . 82 . 83 . 83 . 84 . 85 . 86
16	S Proof Tower Layer: C11 using CH_2O	89
17	7 Other Ideas to Explore 17.1 Aczel [?] 17.2 Chlipala [?] 17.3 Dijkstra [?] 17.4 Feferman [?] 17.4.1 Homann [?] 17.5 Igarashi et al. [Igar75] 17.6 Kamareddine [Kama15]	. 91 . 92 . 93 . 93

	17.7 Mahboubi [?] 17.8 Medina-Bulo et al. [?] 17.9 Pierce [?] 17.10Santas [?] 17.11Spitters [?] 17.12Théry [?]	95 95 96 96 96
\mathbf{A}	The Global Environment	97
В	Related work B.1 Overview of related work	99 99
	B.1.1 Adams [?]	
	B.1.2 Ballarin [?]	
	B.1.4 Berger and Schwichtenberg [?]	
	B.1.5 Cardelli [?]	
	B.1.6 Clarke [?]	
	B.1.7 Crocker [?]	
	B.1.8 Davenport [?]	
	B.1.9 Davenport [?]	
	B.1.10 Davenport [?]	
	B.1.11 Davis [?]	
	B.1.12 Filliatre [?]	
	B.1.13 Frege [?]	
	B.1.14 Gurevich [?]	
	B.1.15 Harrison [?, p13]	
	B.1.16 Hoare [?]	
	B.1.17 Jenks [?]	
	B.1.18 Kifer [?]	
	B.1.19 Manna and Waldinger [?]	
	B.1.20 Meshveliani [?]	
	B.1.21 Myreen [?]	
	B.1.22 Neuper [?]	
	B.1.23 Nordström, Petersson, and Smith [?]	
	B.1.24 O'Donnell [?]	
	B.1.25 Scott and Strachey [?]	
	B.1.26 Smolka [?]	
	B.1.27 Strub, Pierre Yves	
	B.1.28 Sutor [?]	
	B.1.29 Wijngaarden [?, Section 6, p95]	
	B.1.30 McAllester, D. and Arkondas, K., [?]	
	Dilloo Mormosoci, D. and Minondas, II., [1]	144
\mathbf{A}	Untyped Lambda in Common Lisp	123
Ri	oliography	125

CONTENTS	371
Index	161

Bibliography: Axiom Bibliography

1	The	Axiom Bibliography 1
	1.1	Axiom Literate Sources
	1.2	Algebra Documentation References
		1.2.1 A
		1.2.2 B
		1.2.3 C
		1.2.4 D
		1.2.5 E
		1.2.6 F
		1.2.7 G
		1.2.8 H
		1.2.9 I
		1.2.10 J
		1.2.11 K
		1.2.12 L
		1.2.13 M
		1.2.14 N
		1.2.15 O
		1.2.16 P 55
		1.2.17 Q
		1.2.18 R
		1.2.19 S
		1.2.20 T
		1.2.21 U
		1.2.22 V
		1.2.23 W
		1.2.24 X
		1.2.25 Y
		1.2.26 Z
	1.3	Linear Algebra
	1.4	Algebraic Algorithms
	1.5	Sparse Linear Systems
	1.6	Matrix Determinants
	1.7	Open Problems
	1.8	Parallel Evaluation
	1.9	Hybrid Symbolic/Numeric
	-	Software Systems
		The Seven Dwarfs
		Solving Systems of Equations
		Numerical Algorithms
		Special Functions
		Exponential Integral $E_1(x)$
		Polynomial GCD 174

CONTENTS	373
----------	-----

1.17	Category Theory	77
1.18	Proving Axiom Correct – The Project	78
1.19	Coerc ion Survey – Fall 2018	31
	1.19.1 A	31
	1.19.2 B	34
	1.19.3 C	13
	1.19.4 E	
	1.19.5 F	
	1.19.6 G	
	1.19.7 H	
	1.19.8 I	
	1.19.9 J	
	1.19.10 K	
	1.19.11 L	
	1.19.12 M	
	1.19.13 N	
	1.19.140	
	1.19.15 P	
	1.19.16 Q	
	1.19.17 R	
	1.19.18 S	
	1.19.19 T	
	1.19.20 U	
	1.19.21 V	
	1.19.22 W	
	1.19.23 X	
	1.19.24Y	
	1.19.25 Z	
1.20	Proving Axiom Correct – Spring 2018	
	1.20.1 A	
	1.20.2 B	94
	1.20.3 C)4
	1.20.4 D	
	1.20.5 E	
	1.20.6 F	
	1.20.7 G	
	1.20.8 H	
	1.20.9 I	
	1.20.10 J	
	1.20.11 K	
	1.20.12 L	
	1.20.13 M	
	1.20.14 N	
	1.20.15 O	
	1.20.16 P	
	1.20.17 Q	

	1.20.18 R	396
	1.20.19 S	399
	1.20.20 T	412
	1.20.21 W	416
	1.20.22 X	423
	1.20.23 Y	425
	1.20.24 Z	425
1.21	Proving Axiom Sane – Coercion in CAS-Proof Systesms	428
1.22	Proving Axiom Correct – CAS-Proof System Survey	429
	1.22.1 A	
	1.22.2 B	438
	1.22.3 C	467
	1.22.4 D	480
	1.22.5 F	490
	1.22.6 G	495
	1.22.7 H	503
	1.22.8 J	
	1.22.9 K	
	1.22.10 L	
	1.22.11 M	
	1.22.12 N	542
	1.22.13 O	545
	1.22.14 P	546
	1.22.15 R	557
	1.22.16 S	559
	1.22.17 T	565
	1.22.18 W	567
	1.22.19 Y	573
1.23	Interval Arithmetic	573
1.24	Numerics	576
1.25	Advanced Documentation	578
1.26	Differential Equations	580
1.27	Expression Simplification	589
	Integration	
1.29	Partial Fraction Decomposition	636
1.30	Ore Rings	637
1.31	Number Theory	638
	Sparse Polynomial Interpolation	641
1.33	Divisions and Algebraic Complexity	644
1.34	Polynomial Factorization	646
1.35	Branch Cuts	659
1.36	Square-free Decomposition	667
1.37	Symbolic Summation	670
	Differential Forms	685
1.39	v G	688
	1.39.1 A	688

375

	1.39.2 B	693
	1.39.3 C	700
	1.39.4 D	706
		708
		711
		711
		714
		719
		720
		720
		721
		724
	1.39.14R	
	1.39.15 S	
		730
	1.39.17 W	730
	1.39.18 Z	734
1.40	Comparison of Computer Algebra System	734
1.41	Finite Fields	737
1.42	To Be Classified	747
1.43	Axiom Citations in the Literature	798
		798
		812
	1.43.3 C	
	1.43.4 D	
		905
		907
	1.43.7 G	
	1.43.8 H	966 966
		966
		990
	1.43.12L	
	1.43.13 M	
	1.43.14 N	
	1.43.150	
	1.43.16 P	1059
	1.43.17 Q	1065
	1.43.18 R	1065
	1.43.19S	1071
	1.43.20 T	1110
	1.43.21 U	1112
	1.43.22 V	
	1.43.23 W	
	1.43.24 X	
	1.43.25 Y	

376	CONTENTS

			•	•	1146
1.44 Axiom Citations of External Sources		 			1150
1.44.1 A		 			1150
1.44.2 B		 			1158
1.44.3 C		 			1179
1.44.4 D		 			1191
1.44.5 E		 			1203
1.44.6 F		 			1205
1.44.7 G		 			1210
1.44.8 H		 			1225
1.44.9 I		 			1235
1.44.10 J		 			1236
1.44.11 K		 			1238
1.44.12 L		 			1250
1.44.13 M		 			1260
1.44.14 N		 			1271
1.44.15 O		 			1275
1.44.16 P		 			1276
1.44.17 Q		 			1287
1.44.18 R		 			1287
1.44.19 S		 			1297
1.44.20 T		 			1308
1.44.21 U		 			1312
1.44.22 V		 			1313
1.44.23 W		 			1314
1.44.24 X		 			1322
1.44.25 Y		 			1322
1.44.26 Z		 			1322
2 Beebe Bibliography				1	329
Index				1	351