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# **Sage Reference Manual**

***Release 6.6***

**The Sage Development Team**

April 18, 2015



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Welcome to Sage's Reference Manual!

This manual is a thematic index of all of Sage's features. It also contains many examples that illustrate their use, all of them systematically tested with each release.

Enjoy Sage!



## USER INTERFACE

- Command Line Interface (REPL)
- Web Notebook





## GRAPHICS

- 2D Graphics
- 3D Graphics



### 3.1 Parents, Elements and Categories

- Basic Infrastructure
- Coercion
- Categories

### 3.2 Standard Algebraic Structures

- Monoids
- Groups
- Semirings
- Rings
- Algebras

### 3.3 Standard Rings and Fields

- Integers, Rationals, etc.
- Real and Complex Numbers
- Finite Rings and Fields
- Polynomials
- Formal Power Series
- Algebraic Number Fields
- Function Fields
- $p$ -Adic Numbers
- Quaternion Algebras

## 3.4 Linear Algebra

- Matrices and Spaces of Matrices
- Vectors and Modules
- Tensors on free modules of finite rank

## 3.5 Discrete Mathematics

- Combinatorics
- Graph Theory
- Quivers
- Matroid Theory
- Discrete Dynamics
- Coding Theory
- Game Theory

## 3.6 Calculus

- Symbolic Calculus
- Mathematical Constants
- Elementary and Special Functions

## 3.7 Geometry and Topology

- Combinatorial Geometry
- Cell Complexes and their Homology
- Differential Forms
- Parametrized Surfaces

## 3.8 Number Theory, Algebraic Geometry

- Diophantine approximation
- Quadratic Forms
- L-Functions
- Schemes
- Elliptic, Plane, and Hyperelliptic Curves
- Arithmetic Subgroups of  $SL_2(\mathbb{Z})$
- General Hecke Algebras and Hecke Modules

- Modular Symbols
- Modular Forms
- Modular Forms for Hecke Triangle Groups
- Modular Abelian Varieties
- Miscellaneous Modular-Form-Related Modules

## 3.9 Logic

- Symbolic Logic
- SAT solvers

## 3.10 Probability and Statistics

- Probability
- Statistics
- Quantitative Finance

## 3.11 Miscellaneous

- Cryptography
- Optimization
- Databases
- Games



## PROGRAMMING

- Data Structures
- Utilities
- Test Framework
- Parallel Computing

### 4.1 Interfaces

- Interpreter Interfaces
- C/C++ Library Interfaces





## GENERAL INFORMATION

- History and License
- *genindex*
- *modindex*
- *search*

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