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# **Sage 9.5 Reference Manual: External Packages**

*Release 9.5*

**The Sage Development Team**

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## STANDARD PACKAGES

The Sage distribution includes most programs and libraries on which Sage depends. It installs them automatically if it does not find equivalent system packages.

- *\_prereq*: Represents system packages required for installing SageMath from source
- *alabaster*: Default theme for the Sphinx documentation system
- *appdirs*: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.
- *appnope*: Disable App Nap on macOS  $\geq 10.9$
- *arb*: Arbitrary-precision floating-point ball arithmetic
- *argcomplete*: Bash tab completion for argparse
- *argon2\_cffi*: The secure Argon2 password hashing algorithm
- *attrs*: Decorator for Python classes with attributes
- *babel*: Internationalization utilities for Python
- *backcall*: Specifications for callback functions
- *beniget*: Extract semantic information about static Python code
- *bleach*: An HTML-sanitizing tool
- *boost\_cropped*: Portable C++ libraries (subset needed for Sage)
- *brial*: Boolean Ring Algebra implementation using binary decision diagrams
- *bzip2*: High-quality data compressor
- *cddlib*: Double description method for polyhedral representation conversion
- *certifi*: Python package for providing Mozilla’s CA Bundle
- *cffi*: Foreign Function Interface for Python calling C code
- *charset\_normalizer*: The Real First Universal Charset Detector. Open, modern and actively maintained alternative to Chardet.
- *cliquer*: Routines for clique searching
- *cmake*: A cross-platform build system generator
- *combinatorial\_designs*: Data from the Handbook of Combinatorial Designs
- *conway\_polynomials*: Tables of Conway polynomials over finite fields
- *cppy*: C++ headers for C extension development
- *curl*: Multiprotocol data transfer library and utility

- *cvxopt*: Python software for convex optimization
- *cycler*: Composable cycles
- *cypari2*: Python interface to the number theory library *libpari*
- *cysignals*: Interrupt and signal handling for Cython
- *cython*: C-Extensions for Python, an optimizing static compiler
- *dateutil*: Extensions to the standard Python module *datetime*
- *decorator*: Python library providing decorators
- *defusedxml*: Addresses vulnerabilities of XML parsers and XML libraries
- *distlib*: Distribution utilities
- *docutils*: Processing plaintext documentation into useful formats, such as HTML or LaTeX
- *ecl*: An implementation of the Common Lisp language
- *eclib*: Enumerating and computing with elliptic curves defined over the rational numbers
- *ecm*: Elliptic curve method for integer factorization
- *elliptic\_curves*: Databases of elliptic curves
- *entrypoints*: Discover and load entry points from installed Python packages
- *fflas\_ffpack*: Dense linear algebra over word-size finite fields
- *filelock*: A platform independent file lock
- *flint*: Fast Library for Number Theory
- *flintqs*: Multi-polynomial quadratic sieve for integer factorization
- *flit\_core*: Distribution-building parts of Flit. See *flit* package for more information
- *fonttools*: Tools to manipulate font files
- *fpLLL*: Lattice algorithms, including LLL with floating-point orthogonalization
- *fpyLLL*: Python interface for FPLLL
- *freetype*: A free, high-quality, and portable font engine
- *gap*: Groups, Algorithms, Programming - a system for computational discrete algebra
- *gast*: Python AST that abstracts the underlying Python version
- *gc*: The Boehm-Demers-Weiser conservative garbage collector
- *gcc*: The GNU Compiler Collection, including the C, C++ and Fortran compiler
- *gengetopt*: *getopt\_long* parser generator
- *gf2x*: Fast arithmetic in  $GF(2)[x]$  and searching for irreducible/primitive trinomials
- *gfan*: Groebner fans and tropical varieties
- *gfortran*: Fortran compiler from the GNU Compiler Collection
- *giac*: A general purpose computer algebra system
- *givaro*: C++ library for arithmetic and algebraic computations
- *glpk*: GNU Linear Programming Kit
- *gmp*: Library for arbitrary precision arithmetic

- *gmpy2*: Python interface to GMP/MPFR, MPFR, and MPC
- *graphs*: A database of combinatorial graphs
- *gsl*: The GNU Scientific Library
- *html5lib*: An HTML parser
- *iconv*: Library for language/country-dependent character encodings
- *idna*: Internationalized Domain Names in Applications (IDNA)
- *imagesize*: Parser for image file metadata
- *iml*: Integer Matrix Library
- *importlib\_metadata*: Library to access the metadata for a Python package
- *importlib\_resources*: Read resources from Python packages
- *ipykernel*: IPython Kernel for Jupyter
- *ipython*: Interactive computing environment with an enhanced interactive Python shell
- *ipython\_genutils*: Vestigial utilities from IPython
- *ipywidgets*: Interactive HTML widgets for Jupyter notebooks and the IPython kernel
- *jedi*: Static analysis tool providing IDE support for Python
- *jinja2*: General purpose template engine for Python
- *jmol*: Java viewer for chemical structures in 3D
- *jsonschema*: Python implementation of JSON Schema
- *jupyter\_client*: Jupyter protocol implementation and client libraries
- *jupyter\_core*: Jupyter core package
- *jupyter\_ismol*: JSmol viewer widget for Jupyter
- *jupyterlab\_pygments*: Pygments theme using JupyterLab CSS variables
- *kiwisolver*: An implementation of the Cassowary constraint solving algorithm
- *lcalc*: L-function calculator
- *libatomic\_ops*: Access hardware-provided atomic memory update operations
- *libbraiding*: Computing with braids
- *libffi*: A portable foreign-function interface library
- *libgd*: Dynamic graphics generation tool
- *libhomfly*: Compute the homfly polynomial of knots and links
- *liblzma*: General-purpose data compression software
- *libpng*: Bitmap image support
- *linbox*: Linear algebra with dense, sparse, structured matrices over the integers and finite fields
- *lrcalc*: Littlewood-Richardson calculator
- *m4ri*: fast arithmetic with dense matrices over  $GF(2)$
- *m4rie*: Arithmetic with dense matrices over  $GF(2^e)$
- *markupsafe*: Safely add untrusted strings to HTML/XML markup

- *mathjax*: A JavaScript library for displaying mathematical formulas
- *matplotlib*: Python 2D plotting library
- *matplotlib\_inline*: Inline Matplotlib backend for Jupyter
- *maxima*: System for manipulating symbolic and numerical expressions
- *MemoryAllocator*: An extension class to allocate memory easily with cython.
- *mistune*: A markdown parser in pure Python
- *mpc*: Arithmetic of complex numbers with arbitrarily high precision and correct rounding
- *mpfi*: Multiple precision interval arithmetic library based on MPFR
- *mpfr*: Multiple-precision floating-point computations with correct rounding
- *mpmath*: Pure Python library for multiprecision floating-point arithmetic
- *nauty*: Find automorphism groups of graphs, generate non-isomorphic graphs
- *nbclient*: A client library for executing notebooks. Formerly nbconvert's *ExecutePreprocessor*.
- *nbconvert*: Converting Jupyter Notebooks
- *nbformat*: Base implementation of the Jupyter notebook format
- *ncurses*: Classic terminal output library
- *nest\_asyncio*: Patch asyncio to allow nested event loops
- *networkx*: Python package for complex networks
- *notebook*: Jupyter notebook, a web-based notebook environment for interactive computing
- *ntl*: A library for doing number theory
- *numpy*: Package for scientific computing with Python
- *openblas*: An optimized implementation of BLAS (Basic Linear Algebra Subprograms)
- *openssl*: Implementation of the SSL and TLS protocols
- *packaging*: Core utilities for Python packages
- *palp*: A package for Analyzing Lattice Polytopes
- *pandocfilters*: A Python module for writing pandoc filters
- *pari*: Computer algebra system for fast computations in number theory
- *pari\_galdata*: PARI data package needed to compute Galois groups in degrees 8 through 11
- *pari\_seadata\_small*: PARI data package needed by ellap for large primes (small version)
- *parso*: A Python parser
- *patch*: Applies diffs and patches to files
- *pcre*: Perl-compatible regular expressions library
- *pexpect*: Python module for controlling and automating other programs
- *pickleshare*: A 'shelve' like datastore with concurrency support
- *pillow*: Python Imaging Library
- *pip*: Tool for installing and managing Python packages
- *pkgconf*: An implementation of the pkg-config spec



- *pkgconfig*: Python interface to pkg-config
- *planarity*: Planarity-related graph algorithms
- *pluggy*: plugin and hook calling mechanisms for python
- *ply*: Python Lex & Yacc
- *polytopes\_db*: Databases of 2- and 3-dimensional reflexive polytopes
- *ppl*: Parma Polyhedra Library
- *pplpy*: Python interface to the Parma Polyhedra Library
- *pplpy\_doc*: Python interface to the Parma Polyhedra Library (documentation)
- *primecount*: Algorithms for counting primes
- *primecountpy*: Cython interface for C++ primecount library
- *primesieve*: CLI program and C/C++ library for generating primes
- *prometheus\_client*: Python client for the systems monitoring and alerting toolkit Prometheus
- *prompt\_toolkit*: Interactive command lines for Python
- *ptyprocess*: Python interaction with subprocesses in a pseudoterminal
- *py*: library with cross-python path, ini-parsing, io, code, log facilities
- *pybind11*: Create Python bindings to C++ code
- *pycparser*: Parser of the C language in Python
- *pycypwin*: Python bindings for Cygwin's C API
- *pygments*: Generic syntax highlighter
- *pyparsing*: A Python parsing module
- *pysistent*: Persistent data structures in Python
- *python3*: The Python programming language
- *pythran*: Ahead of Time compiler for numeric kernels
- *pytz*: Timezone definitions for Python
- *pyzmq*: Python bindings for the zeromq networking library
- *qhull*: Compute convex hulls, Delaunay triangulations, Voronoi diagrams
- *r*: A free software environment for statistical computing and graphics
- *ratpoints*: Find rational points on hyperelliptic curves
- *readline*: Command line editing library
- *requests*: An HTTP library for Python
- *rpy2*: Python interface to R
- *rw*: Compute rank-width and rank-decompositions
- *sage\_conf*: Configuration module for the SageMath library (distributable version)
- *Sage*: Open Source Mathematics Software: Build system of the Sage documentation
- *sage-setup*: Build system of the SageMath library
- *sagemath\_doc\_html*: SageMath documentation in HTML format

- *sagenb\_export*: Convert legacy SageNB notebooks to Jupyter notebooks and other formats
- *sagetex*: Embed code, results of computations, and plots from Sage into LaTeX documents
- *scipy*: Scientific tools for Python
- *send2trash*: Send file to trash natively under Mac OS X, Windows and Linux
- *setuptools*: Build system for Python packages
- *setuptools\_scm*: Python build system extension to obtain package version from version control
- *setuptools\_scm\_git\_archive*: *setuptools\_scm* plugin for git archives
- *setuptools\_wheel*: Build the *setuptools* package as a wheel
- *simplegeneric*: Simple single-dispatch generic functions for Python
- *singular*: Computer algebra system for polynomial computations, algebraic geometry, singularity theory
- *six*: Python 2 and 3 compatibility utilities
- *snowballstemmer*: Stemmer algorithms for natural language processing in Python
- *sphinx*: Python documentation generator
- *sphinxcontrib\_applehelp*: Sphinx extension which outputs Apple help book
- *sphinxcontrib\_devhelp*: Sphinx extension which outputs Devhelp documents
- *sphinxcontrib\_htmlhelp*: Sphinx extension which outputs HTML help book
- *sphinxcontrib\_jsmath*: Sphinx extension which renders display math in HTML via JavaScript
- *sphinxcontrib\_qthelp*: Sphinx extension which outputs QtHelp documents
- *sphinxcontrib\_serializinghtml*: Sphinx extension which outputs serialized HTML files
- *sphinxcontrib\_websupport*: Sphinx API for Web apps
- *sqlite*: An SQL database engine
- *suitesparse*: A suite of sparse matrix software
- *symmetrica*: Library for representation theory
- *sympow*: Computes special values of symmetric power elliptic curve L-functions
- *sympy*: Python library for symbolic mathematics
- *tachyon*: A ray tracing system
- *terminado*: Tornado websocket backend for the *term.js* Javascript terminal emulator library
- *testpath*: Testing utilities for filesystem-related code
- *thebe*: Add live Jupyter interaction to static websites
- *threejs*: JavaScript library to display 3D graphics in the browser
- *toml*: Python Library for Tom's Obvious, Minimal Language
- *tomli*: A lil' TOML parser
- *tornado*: Python web framework and asynchronous networking library
- *tox*: *tox* is a generic virtualenv management and test command line tool
- *traitlets*: Traitlets Python configuration system
- *typing\_extensions*: Backported and Experimental Type Hints for Python 3.5+

- *tzlocal*: Python timezone information for the local timezone
- *urllib3*: HTTP library with thread-safe connection pooling, file post, and more.
- *vcversioner*: Python build system extension to obtain package version from version control
- *virtualenv*: Virtual Python Environment builder
- *wcwidth*: Measures the displayed width of unicode strings in a terminal
- *webencodings*: Character encoding aliases for legacy web content
- *wheel*: A built-package format for Python
- *widetsnbextension*: Jupyter notebook extension for interactive HTML widgets
- *xz*: General-purpose data compression software
- *zeromq*: A modern networking library
- *zip*: A pathlib-compatible zipfile object wrapper
- *zlib*: Data compression library
- *zn\_poly*: C library for polynomial arithmetic in  $\mathbb{Z}/n\mathbb{Z}[x]$



## OPTIONAL PACKAGES

For additional functionality, you can install some of the following optional packages.

- *4ti2*: Algebraic, geometric and combinatorial problems on linear spaces
- *\_bootstrap*: Represents system packages required for running the top-level bootstrap script
- *\_recommended*: Represents system packages recommended for additional functionality
- *admcycles*: Computation in the tautological ring of the moduli space of curves
- *barvinok*: Projections of integer point sets of parametric polytopes
- *beautifulsoup4*: A screen-scraping library
- *benzene*: Generate fusenes and benzenoids with a given number of faces
- *biopython*: Tools for computational molecular biology
- *bliss*: Computing automorphism groups and canonical forms of graphs
- *buckygen*: Efficient generation of nonisomorphic fullerenes
- *cbc*: COIN-OR branch and cut solver for mixed-integer programs
- *ccache*: A compiler cache
- *coxeter3*: Library for Coxeter groups, Bruhat ordering, Kazhdan-Lusztig polynomials
- *cryptominisat*: A SAT solver
- *csdp*: Solver for semidefinite programs
- *cunningham\_tables*: List of the prime numbers occuring in the Cunningham table
- *d3js*: JavaScript library for manipulating documents based on data
- *database\_cremona\_ellcurve*: Database of elliptic curves
- *database\_jones\_numfield*: Table of number fields
- *database\_knotinfo*: Content of the KnotInfo and LinkInfo databases as lists of dictionaries
- *database\_kohel*: Database of modular and Hilbert polynomials
- *database\_mutation\_class*: Database of exceptional mutation classes of quivers
- *database\_odlyzko\_zeta*: Table of zeros of the Riemann zeta function
- *database\_stein\_watkins*: Database of elliptic curves (full version)
- *database\_stein\_watkins\_mini*: Database of elliptic curves (small version)
- *database\_symbolic\_data*: Database from the SymbolicData project

- *debugpy*: An implementation of the Debug Adapter Protocol for Python
- *dot2tex*: Create PGF/TikZ commands from Graphviz output
- *e\_antic*: Real embedded number fields
- *ffmpeg*: ffmpeg video converter
- *fricas*: A general purpose computer algebra system
- *frobby*: Computations on monomial ideals
- *gap\_jupyter*: Jupyter kernel for GAP
- *gap\_packages*: A collection of GAP packages
- *git*: Version control system
- *glucose*: A SAT solver
- *gp2c*: A compiler for translating GP routines to C
- *graphviz*: Graph visualization software
- *igraph*: A library for creating and manipulating graphs
- *ImageMagick*: A collection of tools and libraries for many image file formats
- *info*: stand-alone Info documentation reader
- *ipympl*: Matplotlib Jupyter Extension
- *isl*: Sets and relations of integer points bounded by affine constraints
- *jupymake*: A Python wrapper for the polymake shell
- *jupyter\_packaging*: Jupyter Packaging Utilities
- *jupyterlab*: An extensible environment for interactive and reproducible computing
- *jupyterlab\_widgets*: A JupyterLab extension for Jupyter/IPython widgets
- *kenzo*: Construct topological spaces and compute homology groups
- *latte\_int*: Count lattice points, compute volumes, and integrate over convex polytopes
- *libgraphviz*: Graph visualization software (callable library)
- *libnauty*: Find automorphism groups of graphs, generate non-isomorphic graphs (callable library)
- *libogg*: Library for the Ogg multimedia container format
- *libsemigroups*: Library for semigroups and monoids
- *libxml2*: XML parser and toolkit
- *lidia*: A library for computational number theory
- *llvm*: The LLVM Compiler Infrastructure, including the Clang C/C++/Objective-C compiler
- *lrslib*: Reverse search algorithm for vertex enumeration and convex hull problems
- *Mathics3*: A general-purpose computer algebra system.
- *mathics\_scanner*: Character Tables and Tokenizer for Mathics and the Wolfram Language.
- *mcqd*: An exact algorithm for finding a maximum clique in an undirected graph
- *meataxe*: Library for computing with modular representations
- *mpfrcx*: Arithmetic of univariate polynomials over arbitrary precision real or complex numbers

- *nibabel*: Access a multitude of neuroimaging data formats
- *ninja\_build*: A build system with a focus on speed
- *nodeenv*: A tool to create isolated node.js environments
- *nodejs*: A JavaScript runtime built on Chrome's V8 JavaScript engine
- *normaliz*: Computations in affine monoids, vector configurations, lattice polytopes, and rational cones
- *notedown*: Create IPython notebooks from markdown
- *ore\_algebra*: Ore algebra
- *p\_group\_cohomology*: Modular cohomology rings of finite groups
- *palettable*: Color palettes for Python
- *pandoc*: A document converter
- *pandoc\_attributes*: A parser and generator for pandoc block attributes
- *pari\_elldata*: PARI data package for elliptic curves
- *pari\_galpol*: PARI data package for polynomials defining Galois extensions of the rationals
- *pari\_nftables*: PARI data package for number fields
- *pari\_seadata*: PARI data package needed by ellap for large primes (full version)
- *pdf2svg* - PDF to SVG convertor
- *perl\_cpan\_polymake\_prereq*: Represents all Perl packages that are prerequisites for polymake
- *perl\_mongodb*: A prerequisite for polymake's PolyDB feature
- *perl\_term\_readline\_gnu*: Perl extension for the GNU Readline/History libraries
- *pint*: Physical quantities module
- *plantri*: Generate non-isomorphic sphere-embedded graphs
- *polylib*: Operations on unions of polyhedra
- *polymake*: Computations with polyhedra, fans, simplicial complexes, matroids, graphs, tropical hypersurfaces
- *polytopes\_db\_4d*: Database of 4-dimensional reflexive polytopes
- *pybtex*: A BibTeX-compatible bibliography processor in Python
- *pycosat*: SAT solver picosat with Python bindings
- *pycryptosat*: Python module of cryptominisat
- *pyflakes*: Passive checker of Python programs
- *pygraphviz*: Python interface to Graphviz
- *pynormaliz*: Python bindings for the normaliz library
- *pysingular*: A basic Python interface to Singular
- *pytest*: Simple powerful testing with Python
- *python\_igraph*: Python bindings for igraph
- *pyx*: Generate PostScript, PDF, and SVG files in Python
- *r\_jupyter*: Jupyter kernel for R
- *rst2ipynb*: Convert reStructuredText files to Jupyter notebooks

- *rubiks*: Programs for Rubik's cube
- *saclib*: Computations with real algebraic numbers
- *sage\_flatsurf*: computation with flat surfaces
- *sage\_numerical\_backends\_coin*: COIN-OR backend for Sage *MixedIntegerLinearProgram*
- *sage\_numerical\_backends\_cplex*: Cplex backend for Sage *MixedIntegerLinearProgram*
- *sage\_numerical\_backends\_gurobi*: Gurobi backend for Sage *MixedIntegerLinearProgram*
- *sage\_sws2rst*: Translate legacy Sage worksheet files (.sws) to *reStructuredText* (.rst) files
- *sagemath\_doc\_pdf*: SageMath documentation in PDF format
- *singular\_jupyter*: Jupyter kernel for Singular
- *sip*: Python extension module generator for C and C++ libraries
- *sirocco*: Compute topologically certified root continuation of bivariate polynomials
- *slabbe*: Sébastien Labbé's Research code
- *snappy*: Topology and geometry of 3-manifolds, with a focus on hyperbolic structures
- *speaklater*: Lazy strings for Python
- *sqlalchemy*: A database abstraction library
- *surface\_dynamics*: dynamics on surfaces (measured foliations, interval exchange transformation, Teichmüller flow, etc)
- *symengine*: A C++ symbolic manipulation library
- *symengine\_py*: Python wrappers for SymEngine
- *tdlib*: Algorithms for computing tree decompositions
- *texlive*: A comprehensive TeX system
- *texttable*: Python module for creating simple ASCII tables
- *tides*: Integration of ODEs
- *topcom*: Compute triangulations of point configurations and oriented matroids



## EXPERIMENTAL PACKAGES

Some packages that provide additional functionality are marked as “experimental”. Developers are needed in order to improve the integration of these packages into the Sage distribution.

- *awali*: Computation of/with finite state machines
- *cocoalib*: Computations in commutative algebra
- *deformation*: Count points on hypersurfaces using the deformation method
- *gambit*: Computations on finite, noncooperative games
- *gap3*: A minimal distribution of GAP 3 containing packages that have no equivalent in GAP 4
- *gdb*: The GNU Project debugger
- *libtheora*: Library for the Theora video codec
- *lie*: Library for the representation theory of complex semisimple Lie groups and algebras
- *modular\_decomposition*: A modular decomposition algorithm
- *qepcad*: Quantifier elimination by partial cylindrical algebraic decomposition
- *scipoptsuite*: Mixed integer programming solver
- *surf*: Visualization of algebraic curves, algebraic surfaces and hyperplane sections of surfaces
- *valgrind*: Memory error detector, call graph generator, runtime profiler



## ALL EXTERNAL PACKAGES

### 4.1 Details of external packages

Packages are in alphabetical order.

#### 4.1.1 4ti2: Algebraic, geometric and combinatorial problems on linear spaces

##### Description

A software package for algebraic, geometric and combinatorial problems on linear spaces. Available at [www.4ti2.de](http://www.4ti2.de).

##### License

4ti2 is released under a GPL v2 license.

##### Upstream Contact

- <https://4ti2.github.io/>
- Raymond Hemmecke, TU Munich, Germany
- Matthias Köppe, UC Davis, CA, USA

##### Dependencies

GLPK, GMP.

##### Type

optional

## Version Information

package-version.txt:

```
1.6.7.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S 4ti2
```

conda:

```
$ conda install 4ti2
```

cygwin:

```
$ apt-cyg install lib4ti2_0 lib4ti2-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install 4ti2
```

Fedora/Redhat/CentOS:

```
$ sudo yum install 4ti2
```

freebsd:

```
$ sudo pkg install math/4ti2
```

gentoo:

```
$ sudo emerge sci-mathematics/4ti2
```

opensuse:

```
$ sudo zypper install 4ti2 4ti2-devel
```

See <https://repology.org/project/4ti2/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.2 `_bootstrap`: Represents system packages required for running the top-level bootstrap script

### Description

This optional script package represents the requirements (system packages) that are needed in addition to those represented by the `_prereq` package in order to run the top-level bootstrap script.

## Type

optional

## Version Information

## Equivalent System Packages

arch:

```
$ sudo pacman -S gettext autoconf automake libtool pkg-config
```

conda:

```
$ conda install gettext autoconf automake libtool
```

cygwin:

```
$ apt-cyg install gettext-devel autoconf automake libtool
```

Debian/Ubuntu:

```
$ sudo apt-get install gettext autoconf automake libtool pkg-config
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gettext-devel autoconf automake libtool pkg-config
```

freebsd:

```
$ sudo pkg install gettext autoconf automake libtool pkg-config
```

gentoo:

```
$ sudo emerge sys-devel/autoconf sys-devel/automake sys-devel/libtool
```

homebrew:

```
$ brew install gettext autoconf automake libtool pkg-config
```

nix:

```
$ nix-env --install gettext autoconf automake libtool pkg-config
```

opensuse:

```
$ sudo zypper install gettext-tools autoconf automake libtool pkgconfig
```

slackware:

```
$ sudo slackpkg install autoconf automake libtool
```

void:

```
$ sudo xbps-install gettext autoconf automake libtool gettext-devel xtools mk-configure
```

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.3 **\_prereq: Represents system packages required for installing SageMath from source**

#### Description

This script package represents the minimal requirements (system packages) for installing SageMath from source.

#### Type

standard

#### Version Information

#### Equivalent System Packages

arch:

```
$ sudo pacman -S binutils make m4 perl python tar bc gcc which
```

conda:

```
$ conda install compilers make m4 perl python tar bc pkg-config
```

cygwin:

```
$ apt-cyg install binutils make m4 python3-urllib3 python3 perl perl-ExtUtils-  
↳MakeMaker tar gcc-core gcc-g++ findutils which libcrypt-devel libiconv-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install binutils make m4 perl python3 tar bc gcc g++ ca-certificates
```

Fedora/Redhat/CentOS:

```
$ sudo yum install binutils make m4 python3 perl perl-ExtUtils-MakeMaker tar gcc gcc-  
↳C++ findutils which diffutils perl-IPC-Cmd
```

freebsd:

```
$ sudo pkg install gmake automake bash dash python
```

gentoo:

```
$ sudo emerge sys-devel/binutils sys-libs/binutils-libs sys-devel/make dev-scheme/guile_  
↳dev-libs/libffi app-arch/tar sys-devel/gcc dev-libs/mpc sys-libs/glibc sys-kernel/  
↳linux-headers dev-lang/perl sys-devel/m4 sys-devel/bc dev-lang/python sys-devel/flex_  
↳app-misc/ca-certificates sys-devel/gettext dev-libs/libcroco dev-libs/libxml2 sys-apps/  
↳findutils sys-apps/which sys-apps/diffutils
```

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homebrew: nix:

```
$ nix-env --install binutils gnumake gnum4 perl python3 gnutar bc gcc bash
```

opensuse:

```
$ sudo zypper install binutils make m4 perl python3 tar bc which glibc-locale-base gcc_
↪gcc-c++ ca-certificates gzip findutils diffutils
```

slackware:

```
$ sudo slackpkg install binutils make guile gc libffi "gcc-[0-9]" gcc-g++ libmpc glibc_
↪kernel-headers perl m4 bc python-2.7 flex ca-certificates pkg-config gettext-tools_
↪libcroco libxml2 cyrus-sasl
```

void:

```
$ sudo xbps-install binutils make m4 perl pkg-config python3 tar bc gcc which
```

If the system package is installed, ./configure will check whether it can be used.

#### 4.1.4 \_recommended: Represents system packages recommended for additional functionality

##### Description

Script package representing a list of system packages recommended to be installed for additional functionality.

##### Type

optional

##### Version Information

##### Equivalent System Packages

Debian/Ubuntu:

```
$ sudo apt-get install texlive-latex-extra texlive-xetex latexmk dvipng default-jdk_
↪libavdevice-dev
```

homebrew:

```
$ brew install texinfo
```

macports: install the following packages: texinfo

If the system package is installed, ./configure will check whether it can be used.

## 4.1.5 admcycles: Computation in the tautological ring of the moduli space of curves

### Description

The SageMath package `admcycles` offers the possibility to compute in the tautological ring of the Deligne-Mumford compactification of the moduli space of curves. Construction for standard generators are provided (`psi`, `kappa` and `lambda` classes) as well as more advanced algebraic construction (double ramification cycle, strata of differentials).

### License

GPLv2+

### Upstream Contact

<https://pypi.org/project/admcycles/>

### Type

optional

### Version Information

requirements.txt:

<code>admcycles</code>
------------------------

### Equivalent System Packages

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.6 alabaster: Default theme for the Sphinx documentation system

### Description

Alabaster is a visually (c)lean, responsive, configurable theme for the Sphinx documentation system. It is Python 2+3 compatible.

It began as a third-party theme, and is still maintained separately, but as of Sphinx 1.3, Alabaster is an install-time dependency of Sphinx and is selected as the default theme.

Live examples of this theme can be seen on [paramiko.org](http://paramiko.org), [fabfile.org](http://fabfile.org) and [pyinvoke.org](http://pyinvoke.org).



## Upstream Contact

<https://alabaster.readthedocs.io/en/latest/>

## Type

standard

## Version Information

package-version.txt:

```
0.7.12
```

install-requires.txt:

```
alabaster >=0.7.12
```

## Equivalent System Packages

conda:

```
$ conda install alabaster
```

opensuse:

```
$ sudo zypper install python3-alabaster
```

See <https://repology.org/project/alabaster/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.7 appdirs: A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.

### Description

A small Python module for determining appropriate platform-specific dirs, e.g. a “user data dir”.

### License

MIT

### Upstream Contact

<https://pypi.org/project/appdirs/>

### Type

standard

### Version Information

package-version.txt:

1.4.4
-------

install-requires.txt:

appdirs
---------

### Equivalent System Packages

If the system package is installed, ./configure will check whether it can be used.

## 4.1.8 appnope: Disable App Nap on macOS >= 10.9

### Description

Disable App Nap on macOS >= 10.9

### License

BSD

### Upstream Contact

<https://pypi.org/project/appnope/>

### Type

standard

## Version Information

package-version.txt:

```
0.1.2
```

install-requires.txt:

```
appnope >=0.1.0
```

## Equivalent System Packages

macports: install the following packages: py-appnope See <https://repology.org/project/python:appnope/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.9 arb: Arbitrary-precision floating-point ball arithmetic

### Description

Arb is a C library for arbitrary-precision floating-point ball arithmetic, developed by Fredrik Johansson ([fredrik.johansson@gmail.com](mailto:fredrik.johansson@gmail.com)). It supports efficient high-precision computation with polynomials, power series, matrices and special functions over the real and complex numbers, with automatic, rigorous error control.

### License

GNU General Public License v2+

### Upstream Contact

- Fredrik Johansson: [fredrik.johansson@gmail.com](mailto:fredrik.johansson@gmail.com)
- <https://arblib.org/>
- <http://github.com/fredrik-johansson/arb/>

### Type

standard

## Version Information

package-version.txt:

```
2.19.0.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S arb
```

conda:

```
$ conda install arb
```

Debian/Ubuntu:

```
$ sudo apt-get install libflint-arb-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install arb arb-devel
```

freebsd:

```
$ sudo pkg install math/arb
```

gentoo:

```
$ sudo emerge sci-mathematics/arb
```

homebrew:

```
$ brew install arb
```

nix:

```
$ nix-env --install arb
```

opensuse:

```
$ sudo zypper install arb-devel
```

void:

```
$ sudo xbps-install arb-devel
```

See <https://repology.org/project/arb-fp/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.10 argcomplete: Bash tab completion for argparse

#### Description

Bash tab completion for argparse

**License**

Apache Software License

**Upstream Contact**

<https://pypi.org/project/argcomplete/>

**Type**

standard

**Version Information**

package-version.txt:

1.12.3
--------

install-requires.txt:

argcomplete
-------------

**Equivalent System Packages**

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.11 argon2\_cffi: The secure Argon2 password hashing algorithm****Description**

The secure Argon2 password hashing algorithm.

**License**

MIT

**Upstream Contact**

<https://pypi.org/project/argon2-cffi/>

## Type

standard

## Version Information

package-version.txt:

20.1.0
--------

install-requires.txt:

argon2-cffi
-------------

## Equivalent System Packages

macports: install the following packages: py-argon2-cffi See <https://repology.org/project/argon2-cffi/versions>, <https://repology.org/project/python:argon2-cffi/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.12 attrs: Decorator for Python classes with attributes

### Description

attrs is the Python package that will bring back the joy of writing classes by relieving you from the drudgery of implementing object protocols (aka dunder methods).

### License

MIT License

### Upstream Contact

Home page: <https://www.attrs.org>

### Dependencies

Python

## Type

standard

## Version Information

package-version.txt:

```
21.2.0
```

install-requires.txt:

```
attrs >=19.3.0
```

## Equivalent System Packages

conda:

```
$ conda install attrs
```

macports: install the following packages: py-attrs See <https://repology.org/project/python:attrs/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.13 awali: Computation of/with finite state machines

### Description

Awali is a software platform dedicated to the computation of, and with, finite state machines. Here finite state machines is to be understood in the broadest possible sense: finite automata with output — often called transducers then — or even more generally finite automata with multiplicity, that is, automata that not only accept, or recognize, sequences of symbols but compute for every such sequence a ‘value’ that is associated with it and which can be taken in any semiring. Hence the variety of situations that can thus be modellized.

### License

- GPL 3.0

### Upstream Contact

- Website: <http://vaucanson-project.org/Awali/index.html>
- Releases: <http://files.vaucanson-project.org/tarballs/>

## Dependencies

- Python
- CMake
- Cython
- ncurses
- graphviz must be installed from your distro, and available in the path.

## Special Update/Build Instructions

- None

## Type

experimental

## Version Information

package-version.txt:

1.0.2-190218
--------------

## Equivalent System Packages

See <https://repology.org/project/awali/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.14 babel: Internationalization utilities for Python

### Description

A collection of tools for internationalizing Python applications.

### Upstream Contact

<http://babel.pocoo.org/en/latest/>



**Type**

standard

**Version Information**

package-version.txt:

```
2.9.1
```

install-requires.txt:

```
babel >=2.6.0
```

**Equivalent System Packages**

conda:

```
$ conda install babel
```

macports: install the following packages: py-babel opensuse:

```
$ sudo zypper install python3-Babel
```

See <https://repology.org/project/python:babel/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.15 backcall: Specifications for callback functions****Description**

Specifications for callback functions passed in to an API

**Type**

standard

**Version Information**

package-version.txt:

```
0.2.0
```

install-requires.txt:

```
backcall >=0.1.0
```

## Equivalent System Packages

conda:

```
$ conda install backcall
```

macports: install the following packages: py-backcall See <https://repology.org/project/python:backcall/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.16 barvinok: Projections of integer point sets of parametric polytopes

#### Description

barvinok is a library for counting the number of integer points in parametric and non-parametric polytopes as well as projections of such sets.

#### License

GPL v2

#### Upstream Contact

- <http://groups.google.com/group/isl-development>

#### Type

optional

#### Version Information

package-version.txt:

```
0.41.1
```

## Equivalent System Packages

opensuse:

```
$ sudo zypper install barvinok "pkgconfig(barvinok)"
```

See <https://repology.org/project/barvinok/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.17 beautifulsoup4: A screen-scraping library

#### Description

Screen-scraping library

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/beautifulsoup4/>

<https://www.crummy.com/software/BeautifulSoup/>

#### Type

optional

#### Version Information

requirements.txt:

```
beautifulsoup4
```

#### Equivalent System Packages

conda:

```
$ conda install beautifulsoup4
```

macports: install the following packages: py-beautifulsoup4 See <https://repology.org/project/python:beautifulsoup4/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.18 beniget: Extract semantic information about static Python code

#### Description

Extract semantic information about static Python code

## License

BSD 3-Clause

## Upstream Contact

<https://pypi.org/project/beniget/>

## Type

standard

## Version Information

package-version.txt:

0.4.1
-------

install-requires.txt:

beniget
---------

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.19 benzene: Generate fusenes and benzenoids with a given number of faces

### Description

Benzene is a program for the efficient generation of all nonisomorphic fusenes and benzenoids with a given number of faces. Fusenes are planar polycyclic hydrocarbons with all bounded faces hexagons. Benzenoids are fusenes that are subgraphs of the hexagonal lattice.

### License

Benzene is licensed under the GNU General Public License v2 or later (June 2007)

### Upstream Contact

Benzene was written by Gunnar Brinkmann and Gilles Caporossi. This version was adapted by Gunnar Brinkmann and Nico Van Cleemput for Grinvin.

<http://www.grinvin.org/>

## Dependencies

- None

## Type

optional

## Version Information

package-version.txt:

```
20130630
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S benzene
```

opensuse:

```
$ sudo zypper install benzene
```

See <https://repology.org/project/benzene/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.20 biopython: Tools for computational molecular biology

### Description

Freely available tools for computational molecular biology.

### License

### Upstream Contact

<https://pypi.org/project/biopython/>

<http://biopython.org/>

## Type

optional

## Version Information

requirements.txt:

```
biopython
```

## Equivalent System Packages

conda:

```
$ conda install biopython
```

macports: install the following packages: py-biopython See <https://repology.org/project/biopython/versions>, <https://repology.org/project/python:biopython/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.21 bleach: An HTML-sanitizing tool

### Description

An easy safelist-based HTML-sanitizing tool.

### License

Apache License v2

### Upstream Contact

Home Page: <https://github.com/mozilla/bleach>

### Dependencies

Python, html5lib, six

**Type**

standard

**Version Information**

package-version.txt:

```
4.1.0
```

install-requires.txt:

```
bleach >=3.1.5
```

**Equivalent System Packages**

conda:

```
$ conda install bleach
```

macports: install the following packages: py-bleach See <https://repology.org/project/python:bleach/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.22 bliss: Computing automorphism groups and canonical forms of graphs****Description**

bliss is an open source tool for computing automorphism groups and canonical forms of graphs.

**License**

LGPL

**Upstream Contact**

Bliss is currently being maintained by Tommi Junttila and Petteri Kaski.

<http://www.tcs.tkk.fi/Software/bliss/index.html>

We apply patches generated from <https://github.com/mkoeppe/bliss> (branch `apply_debian_patches`) as our upstream. This tracks the patches from the Debian package, adding an autotools build system and adjusting the include file locations.

## Dependencies

None

## Type

optional

## Version Information

package-version.txt:

```
0.73+debian-1+sage-2016-08-02.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S bliss
```

conda:

```
$ conda install bliss
```

opensuse:

```
$ sudo zypper install bliss bliss-devel
```

See <https://repology.org/project/bliss-graphs/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.23 boost\_cropped: Portable C++ libraries (subset needed for Sage)

#### Description

Boost provides free peer-reviewed portable C++ source libraries.

We emphasize libraries that work well with the C++ Standard Library. Boost libraries are intended to be widely useful, and usable across a broad spectrum of applications. The Boost license encourages both commercial and non-commercial use.

We aim to establish “existing practice” and provide reference implementations so that Boost libraries are suitable for eventual standardization. Ten Boost libraries are already included in the C++ Standards Committee’s Library Technical Report (TR1) and will be in the new C++0x Standard now being finalized. C++0x will also include several more Boost libraries in addition to those from TR1. More Boost libraries are proposed for TR2.



## License

Boost Software License - see <http://www.boost.org/users/license.html>

## Upstream Contact

Website: <http://www.boost.org/>

See mailing list page at <http://www.boost.org/community/groups.html>

## Dependencies

None

## Type

standard

## Version Information

package-version.txt:

```
1.66.0.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S boost
```

conda:

```
$ conda install boost-cpp
```

cygwin:

```
$ apt-cyg install libboost-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libboost-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install boost-devel
```

freebsd:

```
$ sudo pkg install devel/boost-libs
```

homebrew:

```
$ brew install boost
```

macports: install the following packages: boost nix:

```
$ nix-env --install boost
```

opensuse:

```
$ sudo zypper install boost-devel
```

slackware:

```
$ sudo slackpkg install boost
```

void:

```
$ sudo xbps-install boost-devel
```

See <https://repology.org/project/boost/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.24 brial: Boolean Ring Algebra implementation using binary decision diagrams

### Description

BRiAl (“Boolean Ring Algebra”) is the successor to PolyBoRi.

The core of PolyBoRi is a C++ library, which provides high-level data types for Boolean polynomials and monomials, exponent vectors, as well as for the underlying polynomial rings and subsets of the powerset of the Boolean variables. As a unique approach, binary decision diagrams are used as internal storage type for polynomial structures. On top of this C++-library we provide a Python interface. This allows parsing of complex polynomial systems, as well as sophisticated and extendable strategies for Gröbner base computation. PolyBoRi features a powerful reference implementation for Gröbner basis computation.

### License

GPL version 2 or later

### Upstream Contact

<https://github.com/BRiAl/BRiAl>

## Type

standard

## Version Information

package-version.txt:

```
1.2.8
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S brial
```

conda:

```
$ conda install brial
```

Debian/Ubuntu:

```
$ sudo apt-get install libbrial-dev libbrial-groebner-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install brial brial-devel
```

freebsd:

```
$ sudo pkg install math/brial
```

gentoo:

```
$ sudo emerge sci-libs/brial
```

nix:

```
$ nix-env --install brial
```

opensuse:

```
$ sudo zypper install brial-devel
```

See <https://repology.org/project/brial/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.25 buckygen: Efficient generation of nonisomorphic fullerenes

### Description

Buckygen is a program for the efficient generation of all nonisomorphic fullerenes. These are triangulations where all vertices have degree 5 or 6. Or if the dual representation is used: cubic plane graphs where all faces are pentagons or hexagons.

### License

Buckygen is licensed under the GNU General Public License v3 (June 2007)

### Upstream Contact

Buckygen was mainly written by Jan Goedgebeur, [jan.goedgebeur\[at\]ugent.be](mailto:jan.goedgebeur@ugent.be).

<http://caagt.ugent.be/buckygen/>

### Dependencies

- None

### Type

optional

### Version Information

package-version.txt:

1.1
-----

### Equivalent System Packages

arch:

\$ sudo pacman -S buckygen
----------------------------

opensuse:

\$ sudo zypper install buckygen
---------------------------------

See <https://repology.org/project/buckygen/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.26 bzip2: High-quality data compressor

### Description

bzip2 is a freely available, patent free, high-quality data compressor.

It typically compresses files to within 10% to 15% of the best available techniques (the PPM family of statistical compressors), whilst being around twice as fast at compression and six times faster at decompression.

### License

BSD-style

### Upstream Contact

- Website <http://bzip.org/>
- Author: Julian Seward <[julian@bzip.org](mailto:julian@bzip.org)>

### Dependencies

None

### Special Update/Build Instructions

This package must not be bzip2 compressed, so create it using

```
tar c bzip2-1.0.6 | gzip --best >bzip2-1.0.6.spkg
```

The build system has been autotoolized based on a patch by the Suse folk at [http://ftp.uni-kl.de/pub/linux/suse/people/sbrabec/bzip2/for\\_downstream/bzip2-1.0.6-autoconfiscated.patch](http://ftp.uni-kl.de/pub/linux/suse/people/sbrabec/bzip2/for_downstream/bzip2-1.0.6-autoconfiscated.patch)

See patches/autotools and spkg-src for details.

### Type

standard

### Version Information

package-version.txt:

```
1.0.6-20150304.p0
```

## Equivalent System Packages

conda:

```
$ conda install bzip2
```

cygwin:

```
$ apt-cyg install bzip2 libbz2-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libbz2-dev bzip2
```

Fedora/Redhat/CentOS:

```
$ sudo yum install bzip2 bzip2-devel
```

homebrew:

```
$ brew install bzip2
```

opensuse:

```
$ sudo zypper install bzip2 "pkgconfig(bzip2)"
```

slackware:

```
$ sudo slackpkg install bzip2
```

void:

```
$ sudo xbps-install bzip2-devel
```

See <https://repology.org/project/bzip2/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.27 cbc: COIN-OR branch and cut solver for mixed-integer programs

### Description

The Computational Infrastructure for Operations Research (COIN-OR\*\*, or simply COIN) project is an initiative to spur the development of open-source software for the operations research community.

The COIN Branch and Cut solver (CBC) is an open-source mixed-integer program (MIP) solver written in C++. CBC is intended to be used primarily as a callable library to create customized branch-and-cut solvers. A basic, stand-alone executable version is also available. CBC is an active open-source project led by John Forrest at [www.coin-or.org](http://www.coin-or.org).

## License

Eclipse Public License, Version 1.0 (EPL-1.0) (<http://opensource.org/licenses/eclipse-1.0>)

## Upstream Contact

- John Forrest <[jjforre@us.ibm.com](mailto:jjforre@us.ibm.com)>
- Robin Lougee-Heimer

## Project Home Page

- <https://projects.coin-or.org/Cbc>

## Type

optional

## Version Information

package-version.txt:

```
2.9.4.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S coin-or-cbc
```

conda:

```
$ conda install coincbc
```

Debian/Ubuntu:

```
$ sudo apt-get install coinor-cbc coinor-libcbc-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install coin-or-Cbc coin-or-Cbc-devel
```

freebsd:

```
$ sudo pkg install math/cbc
```

homebrew:

```
$ brew install cbc
```

void:

```
$ sudo xbps-install CoinMP-devel
```

See <https://repology.org/project/coin-or-cbc/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.28 ccache: A compiler cache

### Description

ccache is a compiler cache. It speeds up recompilation by caching previous compilations and detecting when the same compilation is being done again. Supported languages are C, C++, Objective-C and Objective-C++.

### License

GNU General Public License version 3 or later

### Upstream Contact

- Author: Andrew Tridgell
- Website: <http://ccache.samba.org/>

### Type

optional

### Version Information

package-version.txt:

```
3.3.4
```

### Equivalent System Packages

conda:

```
$ conda install ccache
```

homebrew:

```
$ brew install ccache
```

macports: install the following packages: ccache opensuse:

```
$ sudo zypper install ccache
```

void:



```
$ sudo xbps-install ccache
```

See <https://repology.org/project/ccache/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.29 cddlib: Double description method for polyhedral representation conversion

#### Description

The C-library cddlib is a C implementation of the Double Description Method of Motzkin et al. for generating all vertices (i.e. extreme points) and extreme rays of a general convex polyhedron in  $\mathbb{R}^d$  given by a system of linear inequalities:

$$P = \{ x = (x_1, \dots, x_d)^T : b - A x \geq 0 \}$$

where  $A$  is a given  $m \times d$  real matrix,  $b$  is a given  $m$ -vector and  $0$  is the  $m$ -vector of all zeros.

The program can be used for the reverse operation (i.e. convex hull computation). This means that one can move back and forth between an inequality representation and a generator (i.e. vertex and ray) representation of a polyhedron with cdd. Also, cdd can solve a linear programming problem, i.e. a problem of maximizing and minimizing a linear function over  $P$ .

#### License

GPL v2

#### Upstream Contact

<https://github.com/cddlib/cddlib>

#### Type

standard

#### Version Information

package-version.txt:

```
0.94m
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S cddlib
```

conda:

```
$ conda install cddlib
```

cygwin:

```
$ apt-cyg install cddlib-devel cddlib-tools
```

Debian/Ubuntu:

```
$ sudo apt-get install libcdd-dev libcdd-tools
```

Fedora/Redhat/CentOS:

```
$ sudo yum install cddlib
```

freebsd:

```
$ sudo pkg install math/cddlib
```

gentoo:

```
$ sudo emerge sci-libs/cddlib
```

homebrew: macports: install the following packages: cddlib nix:

```
$ nix-env --install cddlib
```

opensuse:

```
$ sudo zypper install cddlib-tools "pkgconfig(cddlib)"
```

See <https://repology.org/project/cddlib/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.30 certifi: Python package for providing Mozilla's CA Bundle

#### Description

Python package for providing Mozilla's CA Bundle.

## License

ISC

## Upstream Contact

Home page: <https://pypi.python.org/pypi/certifi>

## Dependencies

Python, Setuptools

## Type

standard

## Version Information

package-version.txt:

```
2021.10.8
```

install-requires.txt:

```
certifi >=2020.6.20
```

## Equivalent System Packages

conda:

```
$ conda install certifi
```

macports: install the following packages: py-certifi opensuse:

```
$ sudo zypper install python3-certifi
```

See <https://repology.org/project/python:certifi/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.31 cffi: Foreign Function Interface for Python calling C code

### Description

development website: <https://foss.heptapod.net/pypy/cffi>

documentation website: <https://cffi.readthedocs.io/en/latest/>

PyPI page: <https://pypi.org/project/cffi/>

## License

MIT

## Upstream Contact

<https://foss.heptapod.net/pypy/cffi>

## Type

standard

## Version Information

package-version.txt:

```
1.15.0
```

install-requires.txt:

```
cffi >=1.14.0
```

## Equivalent System Packages

conda:

```
$ conda install cffi
```

macports: install the following packages: py-cffi opensuse:

```
$ sudo zypper install python3-cffi
```

See <https://repology.org/project/python:cffi/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.32 charset\_normalizer: The Real First Universal Charset Detector. Open, modern and actively maintained alternative to Chardet.

### Description

The Real First Universal Charset Detector. Open, modern and actively maintained alternative to Chardet.

**License**

MIT

**Upstream Contact**

<https://pypi.org/project/charset-normalizer/>

**Type**

standard

**Version Information**

package-version.txt:

2.0.4
-------

install-requires.txt:

charset-normalizer
--------------------

**Equivalent System Packages**

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.33 cliquer: Routines for clique searching****Description**

Cliquer is a set of C routines for finding cliques in an arbitrary weighted graph. It uses an exact branch-and-bound algorithm developed by Patric Östergård.

**License**

GNU General Public License v2

**Upstream Contact**

Cliquer was mainly written by Sampo Niskanen, [sampo.niskanen@iki.fi](mailto:sampo.niskanen@iki.fi) (Q=@).

<https://users.aalto.fi/~pat/cliquer.html>

## Dependencies

- None

## Patches

- minor config updates (v1.22)
- autotoolized - see <https://github.com/dimpase/autocliquer> (v1.21)

## Type

standard

## Version Information

package-version.txt:

```
1.22
```

## Equivalent System Packages

conda:

```
$ conda install cliquer
```

Debian/Ubuntu:

```
$ sudo apt-get install cliquer libcliquer-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install cliquer cliquer-devel
```

freebsd:

```
$ sudo pkg install math/cliquer
```

gentoo:

```
$ sudo emerge sci-mathematics/cliquer
```

nix:

```
$ nix-env --install cliquer
```

opensuse:

```
$ sudo zypper install cliquer cliquer-devel
```

See <https://repology.org/project/cliquer/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.34 cmake: A cross-platform build system generator

#### Description

The “cmake” executable is the CMake command-line interface. It may be used to configure projects in scripts. Project configuration settings may be specified on the command line with the `-D` option. The `-i` option will cause cmake to interactively prompt for such settings.

CMake is a cross-platform build system generator. Projects specify their build process with platform-independent CMake listfiles included in each directory of a source tree with the name `CMakeLists.txt`. Users build a project by using CMake to generate a build system for a native tool on their platform.

#### License

CMake is distributed under the OSI-approved BSD 3-clause License.

#### Upstream Contact

- <https://cmake.org/>
- [cmake-developers@cmake.org](mailto:cmake-developers@cmake.org)

#### Dependencies

- curl
- zlib
- bzip2
- xz

#### Type

standard

#### Version Information

package-version.txt:

```
3.21.0
```

#### Equivalent System Packages

alpine: install the following packages: cmake arch:

```
$ sudo pacman -S cmake
```

conda:

```
$ conda install cmake
```

cygwin:

```
$ apt-cyg install cmake
```

Debian/Ubuntu:

```
$ sudo apt-get install cmake
```

Fedora/Redhat/CentOS:

```
$ sudo yum install cmake
```

freebsd:

```
$ sudo pkg install devel/cmake
```

gentoo:

```
$ sudo emerge dev-util/cmake
```

homebrew:

```
$ brew install cmake
```

macports: install the following packages: cmake nix:

```
$ nix-env --install cmake
```

opensuse:

```
$ sudo zypper install cmake
```

slackware:

```
$ sudo slackpkg install cmake
```

void:

```
$ sudo xbps-install cmake
```

See <https://repology.org/project/cmake/versions>

If the system package is installed, ./configure will check whether it can be used.

### **4.1.35 cocoalib: Computations in commutative algebra**

#### **Description**

CoCoA is a program to compute with numbers and polynomials.



## License

- GPL v3

## Upstream Contact

- Authors: <http://cocoa.dima.unige.it/research/>
- Email: [cocoa@dim.unige.it](mailto:cocoa@dim.unige.it)
- Website: <http://cocoa.dima.unige.it/>
- Releases: <http://cocoa.dima.unige.it/cocoalib/>

## Type

experimental

## Version Information

package-version.txt:

```
0.99564
```

## Equivalent System Packages

freebsd:

```
$ sudo pkg install math/cocoalib
```

See <https://repology.org/project/cocoalib/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.36 combinatorial\_designs: Data from the Handbook of Combinatorial Designs

### Description

Data for Combinatorial Designs. Current content:

- The table of MOLS (10 000 integers) from the Handbook of Combinatorial Designs, 2ed.

## License

Public domain.

## Upstream Contact

None

## Dependencies

N/A

## Type

standard

## Version Information

package-version.txt:

```
20140630.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S sage-data-combinatorial_designs
```

conda:

```
$ conda install sagemath-db-combinatorial-designs
```

See <https://repology.org/project/sagemath-combinatorial-designs/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.37 configure: Files of the Sage distribution that are autogenerated in the bootstrapping phase

### Description

This package contains a tar archive of auto-generated files. They are shipped with Sage in case you do not have a sufficiently recent autotools version installed.

**License**

GPLv3+

**Upstream Contact**

Automatically generated by Sage, use trac and/or sage-devel for questions.

**Dependencies**

None

**Special Update/Build Instructions**

This tarball is automatically generated by Sage whenever you run the `$SAGE_ROOT/bootstrap -s` or the `$SAGE_ROOT/src/bin/sage-update-version` script.

**Type**

base

**Version Information**

package-version.txt:

2e5d421a71304586f059863c84e61e5d0de00be9
--

**Equivalent System Packages**

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.38 conway\_polynomials: Tables of Conway polynomials over finite fields

**Description**

Frank Lübeck's tables of Conway polynomials over finite fields.

**Dependencies**

- Sage library

## Upstream contact

<http://www.math.rwth-aachen.de/~Frank.Luebeck/data/ConwayPol/>

## Type

standard

## Version Information

package-version.txt:

```
0.5
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S sage-data-conway_polynomials
```

conda:

```
$ conda install sagemath-db-conway-polynomials
```

See <https://repology.org/project/sagemath-conway-polynomials/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.39 coxeter3: Library for Coxeter groups, Bruhat ordering, Kazhdan-Lusztig polynomials

### Description

This package wraps Fokko Ducloux's Coxeter 3 C++ library

Features:

- General Coxeter groups, implemented through the combinatorics of reduced words;
- Reduced expression and normal form computations;
- Bruhat ordering;
- Ordinary Kazhdan-Lusztig polynomials;
- Kazhdan-Lusztig polynomials with unequal parameters;
- Inverse Kazhdan-Lusztig polynomials;
- Cells and W-graphs;

[http://math.univ-lyon1.fr/~ducloux/coxeter/coxeter3/english/coxeter3\\_e.html](http://math.univ-lyon1.fr/~ducloux/coxeter/coxeter3/english/coxeter3_e.html)

This is a patched version done by Mike Hansen 2009-2013 and some fixes by Nicolas M. Thiéry and Jean-Pierre Flori.

## License

GPL

## Upstream Contact

github: <https://github.com/tscrim/coxeter>

Alas, Fokko Ducloux passed away in 2006.

[http://math.univ-lyon1.fr/~ducloux/du\\_Cloux.html](http://math.univ-lyon1.fr/~ducloux/du_Cloux.html)

## Dependencies

None

## Special Update/Build Instructions

The source package was created by running

```
commit=8ac9c71723c8ca57a836d6381aed125261e44e9e
git clone https://github.com/tscrim/coxeter.git
cd coxeter
git archive $commit | bzip2 --best >coxeter-$commit.tar.bz2
```

## Type

optional

## Version Information

package-version.txt:

```
8ac9c71723c8ca57a836d6381aed125261e44e9e.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S coxeter
```

Fedora/Redhat/CentOS:

```
$ sudo yum install coxeter coxeter-devel coxeter-tools
```

opensuse:

```
$ sudo zypper install coxeter
```

See <https://repology.org/project/coxeter/versions>

If the system package is installed, ./configure will check whether it can be used.

#### 4.1.40 cppy: C++ headers for C extension development

##### Description

From: <https://pypi.org/project/cppy/>

A small C++ header library which makes it easier to write Python extension modules. The primary feature is a PyObject smart pointer which automatically handles reference counting and provides convenience methods for performing common object operations.

##### License

Modified BSD 3-Clause-License

##### Upstream Contact

<https://github.com/nucleic/cppy>

##### Type

standard

##### Version Information

package-version.txt:

1.1.0
-------

install-requires.txt:

cpyy
------

##### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

#### 4.1.41 cryptominisat: A SAT solver

##### Description

CryptoMiniSat is a SAT solver that aims to become a premiere SAT solver with all the features and speed of successful SAT solvers, such as MiniSat and PrecoSat. The long-term goals of CryptoMiniSat are to be an efficient sequential, parallel and distributed solver. There are solvers that are good at one or the other, e.g. ManySat (parallel) or PSolver (distributed), but we wish to excel at all.

CryptoMiniSat 2.5 won the SAT Race 2010 among 20 solvers submitted by researchers and industry.

## License

MIT License

## Upstream Contact

- Authors: Mate Soos
- Email: [soos.mate@gmail.com](mailto:soos.mate@gmail.com)
- Website: <http://www.msoos.org/>
- Releases: <https://github.com/msoos/cryptominisat/releases>

## Special Update/Build Instructions

CryptoMiniSat's tarball downloaded from github is called VERSION.tar.gz and should be renamed to cryptominisat-VERSION.tar.gz Its Python module is installed by the pycryptosat spkg.

## Type

optional

## Version Information

package-version.txt:

```
5.6.8
```

## Equivalent System Packages

conda:

```
$ conda install cryptominisat
```

homebrew:

```
$ brew install cryptominisat
```

See <https://repology.org/project/cryptominisat/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.42 csdp: Solver for semidefinite programs

### Description

This is a fast SDP solver written in C, with a callable library namely, an autotool'ed version of CSDP, by Brian Borchers, see <https://projects.coin-or.org/Csdp>

### License

Common Public License Version 1.0

### Upstream Contact

Dmitrii Pasechnik <dimpase+sage@gmail.com>

### Dependencies

### Special Update/Build Instructions

csdp is an autotool'ed version of CSDP, see <https://projects.coin-or.org/Csdp>, developed in its own repository at <https://github.com/dimpase/csdp>.

To update to a new version, you need to bump the version number in `configure.ac` and rerun autotools (`autoreconf -fiv`). Any changes should be merged to the upstream repo.

The build is done with `NOSHORTS` variable defined; this makes it compatible with packages, where `NOSHORTS` must be defined, e.g. <https://github.com/dimpase/pycsdp>; also the Sage Cython interface needs `NOSHORTS` defined.

Detailed steps to build the spkg are as follows. You need

- git
- autotools and libtool (the full autohell suite, version at least 2.67)

With these ready:

- `./spkg-src`
- copy the resulting `csdp-<version>.tar.gz` to `SAGE_ROOT/upstream`, or somewhere else appropriate

### Type

optional

### Version Information

package-version.txt:

6.2.p1
--------



## Equivalent System Packages

arch:

```
$ sudo pacman -S coin-or-csdp
```

See <https://repology.org/project/coin-or-csdp/versions>, <https://repology.org/project/csdp/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.43 `cunningham_tables`: List of the prime numbers occuring in the Cunningham table

The script `read_cunningham_prime_factors.py` was used to generate the data set from the file <http://cage.ugent.be/~jdemeyer/cunningham/main.gz>. We include a local copy, `main.gz` (see comments in the file for details)

#### Type

optional

#### Version Information

package-version.txt:

```
1.0
```

## Equivalent System Packages

See <https://repology.org/project/cunningham-tables/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.44 `curl`: Multiprotocol data transfer library and utility

#### Description

Multiprotocols data transfer library (and utility).

#### License

“MIT style license” : see file “COPYING” at the root of the source tarball, explanations at <https://curl.haxx.se/docs/copyright.html>.

## Upstream Contact

According to the file README at the root of the tarball, contact is done by mailing <https://curl.haxx.se/mail/>

## Dependencies

None listed.

## Special Update/Build Instructions

None.

## Type

standard

## Version Information

package-version.txt:

```
7.62.0.p0
```

## Equivalent System Packages

conda:

```
$ conda install curl
```

cygwin:

```
$ apt-cyg install libcurl-devel curl
```

Debian/Ubuntu:

```
$ sudo apt-get install curl libcurl4-openssl-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libcurl-devel curl
```

freebsd:

```
$ sudo pkg install ftp/curl
```

homebrew:

```
$ brew install curl
```

macports: install the following packages: curl opensuse:

```
$ sudo zypper install curl "pkgconfig(libcurl)"
```

slackware:

```
$ sudo slackpkg install curl cyrus-sasl openldap-client libssh2
```

void:

```
$ sudo xbps-install curl libcurl-devel
```

See <https://repology.org/project/curl/versions>

If the system package is installed, `./configure` will check whether it can be used.

### 4.1.45 cvxopt: Python software for convex optimization

#### Description

CVXOPT is a free software package for convex optimization based on the Python programming language. It can be used with the interactive Python interpreter, on the command line by executing Python scripts, or integrated in other software via Python extension modules. Its main purpose is to make the development of software for convex optimization applications straightforward by building on Python's extensive standard library and on the strengths of Python as a high-level programming language.

#### Upstream Contact

- J. Dahl <[dahl.joachim@gmail.com](mailto:dahl.joachim@gmail.com)>
- L. Vandenberghe <[vandenbe@ee.ucla.edu](mailto:vandenbe@ee.ucla.edu)>

<https://cvxopt.org/>

#### License

GPLv3 or later. Includes parts under GPLv2, GNU Lesser General Public License, v2.1. See `src/LICENSE` for more details. (Sage-compatible)

#### Dependencies

- GNU patch
- GSL
- GLPK

## Special Update/Build Instructions

- `cvxopt.h.patch`: Fix building with GCC on Solaris.
- `setup.py.patch`: look for libraries and includes in `$SAGE_LOCAL` instead of `/usr`. Add fortran, blas,... libraries if needed. Build with GSL and GLPK support.
- remove `doc/html/`, as it can be rebuild by invoking `'sage -sh'` and running `'make html'` in `doc/`
- TODO: Add more tests in `spkg-check`
- TODO: one might want to enhance the code to allow other Sage random sources, at the moment only GSL is used in CVXOPT-1.1.3 spkg, apparently it will need an unclear to me “with seed(..)” construct.

## Type

standard

## Version Information

package-version.txt:

```
1.2.7
```

install-requires.txt:

```
cvxopt >=1.2.5
```

## Equivalent System Packages

conda:

```
$ conda install cvxopt
```

freebsd:

```
$ sudo pkg install math/py-cvxopt
```

macports: install the following packages: `py-cvxopt` See <https://repology.org/project/python:cvxopt/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.46 `cycler`: Composable cycles

### Description

Cycler is a small break-off of matplotlib to deal with “composable cycles”. It is a required dependency of matplotlib 1.5.0.

## License

BSD

## Upstream Contact

cycler is developed on github: <https://github.com/matplotlib/cycler>

A more informative webpage about cycler, its motivation and usage is at <http://tacaswell.github.io/cycler/>

## Dependencies

- python
- setuptools
- six

## Type

standard

## Version Information

package-version.txt:

```
0.11.0
```

install-requires.txt:

```
cycler >=0.10.0
```

## Equivalent System Packages

conda:

```
$ conda install cycler
```

macports: install the following packages: py-cycler See <https://repology.org/project/cycler/versions>, <https://repology.org/project/python:cycler/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.47 cypari2: Python interface to the number theory library libpari

#### Description

A Python interface to the number theory library libpari.

#### License

GPL version 2 or later

#### Upstream Contact

<https://github.com/defeo/cypari2>

#### Dependencies

- Python
- Cython
- PARI
- cysignals

#### Type

standard

#### Version Information

package-version.txt:

```
2.1.2
```

install-requires.txt:

```
cypari2 >=2.1.1
```

#### Equivalent System Packages

conda:

```
$ conda install cypari2
```

See <https://repology.org/project/python:cypari2/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.48 cysignals: Interrupt and signal handling for Cython

### Description

Interrupt and signal handling for Cython

### License

LGPL version 3 or later

### Upstream Contact

<https://github.com/sagemath/cysignals>

### Dependencies

- Python
- Cython
- PARI (optional)

### Type

standard

### Version Information

package-version.txt:

```
1.11.2
```

install-requires.txt:

```
cysignals >=1.10.2
```

### Equivalent System Packages

conda:

```
$ conda install cysignals
```

See <https://repology.org/project/cysignals/versions>, <https://repology.org/project/python:cysignals/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.49 cython: C-Extensions for Python, an optimizing static compiler

### Description

Cython is a language that makes writing C extensions for the Python language as easy as Python itself. Cython is based on the well-known Pyrex, but supports more cutting edge functionality and optimizations.

The Cython language is very close to the Python language, but Cython additionally supports calling C functions and declaring C types on variables and class attributes. This allows the compiler to generate very efficient C code from Cython code.

This makes Cython the ideal language for wrapping for external C libraries, and for fast C modules that speed up the execution of Python code.

### License

Apache License, Version 2.0

### Upstream Contact

- <http://www.cython.org/>
- [cython-devel@python.org](mailto:cython-devel@python.org)

### Dependencies

- Python

### Type

standard

### Version Information

package-version.txt:

0.29.24
---------

install-requires.txt:

cython >=0.29.21, <1.0
------------------------



## Equivalent System Packages

conda:

```
$ conda install cython
```

freebsd:

```
$ sudo pkg install lang/cython
```

homebrew:

```
$ brew install cython
```

macports: install the following packages: py-cython See <https://repology.org/project/python:cython/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.50 d3js: JavaScript library for manipulating documents based on data

#### Description

D3.js is a JavaScript library for manipulating documents based on data. The file d3.min.js will be placed into the `${SAGE_SHARE}/d3js/` directory.

#### License

BSD 3-Clause License

#### Upstream Contact

- Author: Mike Bostock (<http://bost.ocks.org/mike/>)
- Home page: <http://d3js.org/>

#### Dependencies

None.

#### Special Update/Build Instructions

Two kind of archives can be downloaded from d3.js website: one with all source code and tests that weights 2,9M (both in zip and tar.gz formats) and one with the final javascript scripts which weights 121K (zip format only). Since testing requires node.js that is not shipped with Sage, we currently ship the final js only. Hence we have to transform it from zip to tar.gz format. Running sage-src should do all the repackaging job.

## Type

optional

## Version Information

package-version.txt:

3.4.8
-------

## Equivalent System Packages

See <https://repology.org/project/node:d3/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.51 database\_cremona\_ellcurve: Database of elliptic curves

### Description

John Cremona's database of elliptic curves

See <https://github.com/JohnCremona/ecdata>

This is an optional package, not included by default.

### License

Public Domain

### Dependencies

None

### Patches

- None

### Upstream Contact

- Author: John Cremona
- Email: [john.cremona@gmail.com](mailto:john.cremona@gmail.com)
- Website: <http://homepages.warwick.ac.uk/staff/J.E.Cremona/>

## Update Instructions

Get an up-to-date copy of the git repository ecdata from <https://github.com/JohnCremona/ecdata>.

If the cremona database has already been installed, remove `SAGE_DATA/cremona/cremona.db`. Then run

The build script expects to find the files in subfolders `allcurves`, `allgens`, `degphi` and `allbsd` of the `ecdata` folder. It extracts them and builds the new `cremona.db` file from the contents.

Finally, copy `SAGE_DATA/cremona/cremona.db` to the `src` directory of the `spkg`.

## Type

optional

## Version Information

package-version.txt:

20190911
----------

## Equivalent System Packages

See <https://repology.org/project/sage-data-cremona-ellcurve/versions>, <https://repology.org/project/sagemath-database-cremona-elliptic-curves/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.52 database\_jones\_numfield: Table of number fields

### Description

This is a table of number fields with bounded ramification and degree at most 6.

### License

GPLv2+

### Upstream Contact

[sage-devel@googlegroups.com](mailto:sage-devel@googlegroups.com)

## Dependencies

None

## Special Update/Build Instructions

Created by taking the original old-style spkg and removing crud from it.

## Type

optional

## Version Information

package-version.txt:

4
---

## Equivalent System Packages

See <https://repology.org/project/sage-data-jones-numfield/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.53 database\_knotinfo: Content of the KnotInfo and LinkInfo databases as lists of dictionaries

### Description

Content of the KnotInfo and LinkInfo databases as lists of dictionaries

### License

GPL

### Upstream Contact

<https://pypi.org/project/database-knotinfo/>

**Type**

optional

**Version Information**

package-version.txt:

2021.10.1
-----------

install-requires.txt:

database-knotinfo
-------------------

**Equivalent System Packages**

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.54 database\_kohel: Database of modular and Hilbert polynomials****Description**

Database of modular and Hilbert polynomials.

**Upstream Contact**

- David Kohel <[David.Kohel@univ-amu.fr](mailto:David.Kohel@univ-amu.fr)>

**Type**

optional

**Version Information**

package-version.txt:

20160724
----------

**Equivalent System Packages**

See <https://repology.org/project/sage-data-kohel/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.55 `database_mutation_class`: Database of exceptional mutation classes of quivers

#### Description

Contains a database of all exceptional mutation classes of quivers.

Every file in the database is of the form `mutation_classes_n.dig6` for some `n` and

- contains a `cPickle.dump` of a dictionary where
- the keys are tuples representing irreducible exceptional quiver mutation types of rank `n`, and
- the values are all quivers in the given mutation class stored in canonical form as `(dig6, edges)` where
- `dig6` is the `dig6` data of the given `DiGraph`, and
- `edges` are the non-simply-laced edges thereof.
- is obtained by running the function  

```
sage.combinat.cluster_algebra_quiver.quiver_mutation_type._save_data_dig6(n,  
types='Exceptional', verbose=False)
```

#### SPKG Maintainers

- C. Stump <[christian.stump@gmail.com](mailto:christian.stump@gmail.com)>

#### Dependencies

- None

#### Type

optional

#### Version Information

package-version.txt:

1.0
-----

#### Equivalent System Packages

See <https://repology.org/project/database-mutation-class/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.56 database\_odlyzko\_zeta: Table of zeros of the Riemann zeta function

#### Description

Table of zeros of the Riemann zeta function by Andrew Odlyzko.

This package contains the file ‘zeros6’ with the first 2,001,052 zeros of the Riemann zeta function, accurate to within  $4 \cdot 10^{(-9)}$ .

#### Dependencies

- Sage library

#### Type

optional

#### Version Information

package-version.txt:

20061209
----------

#### Equivalent System Packages

See <https://repology.org/project/sage-data-odlyzko-zeta/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.57 database\_stein\_watkins: Database of elliptic curves (full version)

#### Description

The Stein-Watkins database of elliptic curves (full version)

See <http://modular.math.washington.edu/papers/stein-watkins/>

This is an optional (huge) package, not included by default.

#### License

Public Domain

### Dependencies

None

### Patches

None

### Type

optional

### Version Information

package-version.txt:

20110713
----------

### Equivalent System Packages

See <https://repology.org/project/database-stein-watkins/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.58 database\_stein\_watkins\_mini: Database of elliptic curves (small version)

### Description

The Stein-Watkins database of elliptic curves (small version)

See <http://modular.math.washington.edu/papers/stein-watkins/>

This is an optional package, not included by default.

### License

Public Domain

### Dependencies

None



**Patches**

None

**Type**

optional

**Version Information**

package-version.txt:

20070827
----------

**Equivalent System Packages**

See <https://repology.org/project/database-stein-watkins-mini/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

**4.1.59 database\_symbolic\_data: Database from the SymbolicData project****Description**

The SymbolicData project is set out

- to develop concepts and tools for profiling, testing and benchmarking Computer Algebra Software (CAS) and
- to collect and interlink relevant data and activities from different Computer Algebra Communities.

SymbolicData is an

- inter-community project that has its roots in the activities of different Computer Algebra Communities and
- aims at interlinking these activities using modern Semantic Web concepts.

Tools and data are designed to be used both

- on a local site for special testing and profiling purposes
- and to manage a central repository at [www.symbolicdata.org](http://www.symbolicdata.org).

**License**

GNU General Public License

### Upstream Contact

- Andreas Nareike <nareike@informatik.uni-leipzig.de>

### Dependencies

### Special Update/Build Instructions

List patches that need to be applied and what they do

### Type

optional

### Version Information

package-version.txt:

20070206
----------

### Equivalent System Packages

See <https://repology.org/project/database-symbolic-data/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.60 dateutil: Extensions to the standard Python module datetime

### Description

The dateutil module provides powerful extensions to the standard datetime module.

### License

Simplified BSD License

### Upstream Contact

Author: Gustavo Niemeyer <gustavo@niemeyer.net>

Home page: <http://labix.org/python-dateutil>

<https://pypi.org/project/python-dateutil/>

## Dependencies

- Python
- Six

## Type

standard

## Version Information

package-version.txt:

```
2.8.2
```

install-requires.txt:

```
dateutil >=2.8.1
```

## Equivalent System Packages

conda:

```
$ conda install python-dateutil
```

macports: install the following packages: py-dateutil See <https://repology.org/project/python/python-dateutil/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.61 debugpy: An implementation of the Debug Adapter Protocol for Python

### Description

An implementation of the Debug Adapter Protocol for Python

### License

MIT

### Upstream Contact

<https://pypi.org/project/debugpy/>

## Type

optional

## Version Information

package-version.txt:

```
1.4.1
```

install-requires.txt:

```
debugpy
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.62 decorator: Python library providing decorators

### Description

Better living through Python with decorators

## Type

standard

## Version Information

package-version.txt:

```
4.4.2
```

install-requires.txt:

```
decorator >=4.4.0
```

## Equivalent System Packages

conda:

```
$ conda install decorator
```

macports: install the following packages: py-decorator opensuse:

```
$ sudo zypper install python3-decorator
```

See <https://repology.org/project/python:decorator/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.63 deformation: Count points on hypersurfaces using the deformation method

#### Description

Deformation is a C library for counting points on hypersurfaces using the deformation method, developed by Sebastian Pancratz.

#### License

GLPv3

#### Upstream Contact

- Sebastian Pancratz: [sebastian.pancratz@gmail.com](mailto:sebastian.pancratz@gmail.com), [sage-devel@googlegroups.com](mailto:sage-devel@googlegroups.com)
- We use the fork at <https://github.com/sagemath/deformation> the fork uses GMP instead of MPIR, and Flint 2.7+.

#### Type

experimental

#### Version Information

package-version.txt:

20210503
----------

#### Equivalent System Packages

See <https://repology.org/project/deformation/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.64 defusedxml: Addresses vulnerabilities of XML parsers and XML libraries

#### Description

defusedxml addresses vulnerabilities of XML parsers and XML libraries.

It became a dependency of nbconvert starting with nbconvert 5.4.

## License

Python Software Foundation License (PSFL)

## Upstream Contact

<https://pypi.org/project/defusedxml/>

## Dependencies

- pip

## Special Update/Build Instructions

None.

## Type

standard

## Version Information

package-version.txt:

```
0.6.0
```

install-requires.txt:

```
defusedxml >=0.6.0
```

## Equivalent System Packages

conda:

```
$ conda install defusedxml
```

macports: install the following packages: py-defusedxml See <https://repology.org/project/python:defusedxml/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

#### 4.1.65 distlib: Distribution utilities

##### Description

Distribution utilities

##### License

Python license

##### Upstream Contact

<https://pypi.org/project/distlib/>

##### Type

standard

##### Version Information

package-version.txt:

0.3.3
-------

install-requires.txt:

distlib
---------

##### Equivalent System Packages

If the system package is installed, ./configure will check whether it can be used.

#### 4.1.66 docutils: Processing plaintext documentation into useful formats, such as HTML or LaTeX

##### Description

Docutils is a modular system for processing documentation into useful formats, such as HTML, XML, and LaTeX. For input Docutils supports reStructuredText, an easy-to-read, what-you-see-is-what-you-get plaintext markup syntax.

## License

Modified BSD

## Upstream Contact

Author: David Goodger

Home Page: <http://docutils.sourceforge.net/>

## Dependencies

None

## Special Update/Build Instructions

None

## Type

standard

## Version Information

package-version.txt:

```
0.17.1
```

install-requires.txt:

```
docutils >=0.14
```

## Equivalent System Packages

conda:

```
$ conda install docutils
```

homebrew:

```
$ brew install docutils
```

macports: install the following packages: py-docutils opensuse:

```
$ sudo zypper install python3-docutils
```

See <https://repology.org/project/docutils/versions>, <https://repology.org/project/python:docutils/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>



### 4.1.67 dot2tex: Create PGF/TikZ commands from Graphviz output

#### Description

dot2tex is a Python module, whose purpose is to give graphs generated by Graphviz a more LaTeX friendly look and feel. This is accomplished by converting xdot output from Graphviz to a series of PSTricks or PGF/TikZ commands.

See <https://github.com/kjellmf/dot2tex/>

#### License

- MIT

#### Upstream Contact

- Kjell Magne Fauske, [km@fauskes.net](mailto:km@fauskes.net)

#### Dependencies

graphviz ([www.graphviz.org](http://www.graphviz.org)) should be installed and in the path (for example via the graphviz spkg).

preview, a LaTeX package for extracting parts of a document.

Self-tests dependencies:

- graphviz
- texlive-latex-base
- texlive-pictures
- texlive-pstricks

#### Patches

- remove\_test\_semicolon.patch:

Remove the failing semicolon test for the open dot2tex issue #5 - <https://github.com/kjellmf/dot2tex/issues/5>

#### Special Update/Build Instructions

Make sure corresponding optional doctests still pass:

```
sage -t --long --optional=dot2tex,graphviz,sage src/
```

## Type

optional

## Version Information

package-version.txt:

```
2.11.3.p0
```

install-requires.txt:

```
dot2tex >=2.11.3
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S dot2tex
```

macports: install the following packages: dot2tex See <https://repology.org/project/dot2tex/versions>, <https://repology.org/project/python:dot2tex/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.68 e\_antic: Real embedded number fields

### Description

e-antic is a C library for exact computations with real embedded number field maintained by Vincent Delecroix.

Website: <https://github.com/videlec/e-antic>

### License

e-antic is licensed GPL v3.

### Upstream Contact

- <https://github.com/videlec/e-antic>

**Type**

optional

**Version Information**

package-version.txt:

```
0.1.9
```

**Equivalent System Packages**

conda:

```
$ conda install e-antic
```

See <https://repology.org/project/e-antic/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

**4.1.69 ecl: An implementation of the Common Lisp language****Description**

ECL is an implementation of the Common Lisp language as defined by the ANSI X3J13 specification. The most relevant features:

- A bytecodes compiler and interpreter.
- Compiles Lisp also with any C/C++ compiler.
- It can build standalone executables and libraries.
- ASDF, Sockets, Gray streams, MOP, and other useful components.
- Extremely portable.
- A reasonable license.

ECL supports the operating systems Linux, FreeBSD, NetBSD, OpenBSD, Solaris and Windows, running on top of the Intel, Sparc, Alpha and PowerPC processors. Porting to other architectures should be rather easy.

Website: <http://ecls.sourceforge.net/>

**License**

- LGPL V2+ or compatible - for details see <http://ecls.sourceforge.net/license.html>

## Upstream Contact

- the ECL mailing list - see <http://ecls.sourceforge.net/resources.html>

## Special Update/Build Instructions

- Note: for the time being, ECL is built single threaded library as it seems to interact badly with the pexpect interface and Sage's signal handling when built multithreaded.
- Do NOT quote SAGE\_LOCAL when setting CPPFLAGS and/or LDFLAGS, in spkg-install as this caused the build to break. See [http://trac.sagemath.org/sage\\_trac/ticket/10187#comment:117](http://trac.sagemath.org/sage_trac/ticket/10187#comment:117)
- TODO: Add the ECL test suite, and an spkg-check file to run it.
- TODO: Make ECL use Sage's Boehm GC on MacOS X as well (but perhaps put some changes from ECL's into Sage's Boehm GC), then remove the src/src/gc directory, too.

## Type

standard

## Version Information

package-version.txt:

```
21.2.1
```

## Equivalent System Packages

alpine: install the following packages: ecl-dev arch:

```
$ sudo pacman -S ecl
```

conda:

```
$ conda install ecl
```

Debian/Ubuntu:

```
$ sudo apt-get install ecl
```

Fedora/Redhat/CentOS:

```
$ sudo yum install ecl
```

freebsd:

```
$ sudo pkg install lang/ecl
```

gentoo:

```
$ sudo emerge dev-lisp/ecls
```

homebrew:

```
$ brew install ecl
```

macports: install the following packages: ecl nix:

```
$ nix-env --install ecl
```

void:

```
$ sudo xbps-install ecl
```

See <https://repology.org/project/ecl/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.70 eclib: Enumerating and computing with elliptic curves defined over the rational numbers

#### Description

John Cremona's programs for enumerating and computing with elliptic curves defined over the rational numbers.

mwrank is a program written in C++ for computing Mordell-Weil groups of elliptic curves over  $\mathbb{Q}$  via 2-descent. It is available as source code in the eclib package, which may be distributed under the GNU General Public License, version 2, or any later version.

mwrank is now only distributed as part of eclib. eclib is also included in Sage, and for most potential users the easiest way to run mwrank is to install Sage (which also of course gives you much much more). I no longer provide a source code distribution of mwrank by itself: use eclib instead.

#### License

eclib is licensed GPL v2+.

#### Upstream Contact

- Author: John Cremona
- Email: [john.cremona@gmail.com](mailto:john.cremona@gmail.com)
- Website: <http://homepages.warwick.ac.uk/staff/J.E.Cremona/mwrank/index.html>
- Repository: <https://github.com/JohnCremona/eclib>

#### Dependencies

- PARI
- NTL
- FLINT

## Type

standard

## Version Information

package-version.txt:

```
20210625
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S eclib
```

conda:

```
$ conda install eclib
```

Debian/Ubuntu:

```
$ sudo apt-get install libec-dev eclib-tools
```

Fedora/Redhat/CentOS:

```
$ sudo yum install eclib eclib-devel
```

freebsd:

```
$ sudo pkg install math/eclib
```

gentoo:

```
$ sudo emerge sci-mathematics/eclib[flint]
```

nix:

```
$ nix-env --install eclib
```

void:

```
$ sudo xbps-install eclib-devel
```

See <https://repology.org/project/eclib/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.71 ecm: Elliptic curve method for integer factorization

#### Description

GMP-ECM - Elliptic Curve Method for Integer Factorization

Sources can be obtained from <http://gforge.inria.fr/projects/ecm/>

#### License

LGPL V3+

#### Upstream Contact

- [ecm-discuss@lists.gforge.inria.fr](mailto:ecm-discuss@lists.gforge.inria.fr) (requires subscription)

#### Special Update/Build Instructions

- GMP-ECM comes with a self-tuning feature; we could support that as an option (`$SAGE_TUNE_*=yes`) in the future.
- ECM currently does not (by itself) use the `CC` and `CFLAGS` settings from `'gmp.h'` since we pass (other) options in `CFLAGS`, and `CC` is set by Sage and might get set by the user. We now at least partially fix that such that “optimized” code generation options (`'-mcpu=...'`, `'-mtune=...'`) are used by gcc. Of course a user can also manually enable them by setting the “global” `CFLAGS` to e.g. `'-march=native'` on x86[\_64] systems, or `'-mcpu=...'` and `'-mtune=...'` on other architectures where “native” isn’t supported. Note that this doesn’t affect the packages’ selection of processor- specific optimized [assembly] code. `'spkg-install'` already reads the settings from Sage’s and also a system-wide GMP now, but doesn’t (yet) use all of them. If `SAGE_FAT_BINARY=“yes”`, we should avoid too specific settings of `“-mcpu=...”`, and perhaps pass a more generic `“-host=...”` to `'configure'`.
- We currently work around a linker bug on MacOS X 10.5 PPC (with GCC 4.2.1) which breaks `'configure'` if debug symbols are enabled. This *might* get fixed in later upstream releases.
- We could save some space by removing the `src/build.vc10/` directory which isn’t used in Sage. (It gets probably more worth in case also directories / files for later versions of Microsoft Visual C get added.)

#### Type

standard

#### Version Information

package-version.txt:

7.0.4.p2
----------

## Equivalent System Packages

conda:

```
$ conda install ecm
```

Debian/Ubuntu:

```
$ sudo apt-get install gmp-ecm libecm-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gmp-ecm gmp-ecm-devel
```

freebsd:

```
$ sudo pkg install math/gmp-ecm
```

macports: install the following packages: gmp-ecm nix:

```
$ nix-env --install ecm
```

void:

```
$ sudo xbps-install ecm-devel
```

See <https://repology.org/project/gmp-ecm/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.72 elliptic\_curves: Databases of elliptic curves

### Description

Includes two databases:

- A small subset of John Cremona's database of elliptic curves up to conductor 10000.
- William Stein's database of interesting curves

### Upstream Contact

#### cremona\_mini

- Author: John Cremona
- Email: [john.cremona@gmail.com](mailto:john.cremona@gmail.com)
- Website: <http://johncremona.github.io/ecdata/>



**ellcurves**

- Author: William Stein
- Email: [wstein@gmail.com](mailto:wstein@gmail.com)

**Dependencies**

- sqlite
- python

**Type**

standard

**Version Information**

package-version.txt:

```
0.8.1
```

**Equivalent System Packages**

conda:

```
$ conda install sagemath-db-elliptic-curves
```

See <https://repology.org/project/sagemath-elliptic-curves/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

**4.1.73 entrypoints: Discover and load entry points from installed Python packages****Description**

Discover and load entry points from installed packages.

**Upstream Contact**

<https://github.com/takluyver/entrypoints>

## Special Update/Build Instructions

Upstream does not provide a source tarball, so the tarball was taken from github and renamed.  
The source tarball does not contain setup.py, so we put the setup commands in spkg-install.

## Type

standard

## Version Information

package-version.txt:

```
0.3
```

install-requires.txt:

```
entrypoints >=0.3
```

## Equivalent System Packages

conda:

```
$ conda install entrypoints
```

macports: install the following packages: py-entrypoints See <https://repology.org/project/entrypoints/versions>, <https://repology.org/project/python:entrypoints/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.74 fflas\_ffpack: Dense linear algebra over word-size finite fields

### Description

FFLAS-FFPACK is a LGPL-2.1+ source code library for dense linear algebra over word-size finite fields.

<http://linbox-team.github.io/fflas-ffpack/>

### License

LGPL V2.1 or later

## SPKG Repository

<https://bitbucket.org/malb/fblas-ffpack-spkg>

## Upstream Contact

- <ffpack-devel@googlegroups.com>

## Dependencies

- Givaro
- a BLAS implementation such as openblas

## Patches

- bash.patch: fix shebang line to “#!/usr/bin/env bash”

## Type

standard

## Version Information

package-version.txt:

```
2.4.3.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S fblas-ffpack
```

conda:

```
$ conda install fblas-ffpack
```

Debian/Ubuntu:

```
$ sudo apt-get install fblas-ffpack
```

Fedora/Redhat/CentOS:

```
$ sudo yum install fblas-ffpack-devel
```

freebsd:

```
$ sudo pkg install math/fblas-ffpack
```

gentoo:

```
$ sudo emerge sci-libs/fflas-ffpack
```

nix:

```
$ nix-env --install fflas-ffpack
```

opensuse:

```
$ sudo zypper install "pkgconfig(fflas-ffpack)"
```

See <https://repology.org/project/fflas-ffpack/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.75 ffmpeg: ffmpeg video converter

### Description

ffmpeg is a very fast video and audio converter that can also grab from a live audio/video source. It can also convert between arbitrary sample rates and resize video on the fly with a high quality polyphase filter.

### License

“FFmpeg is licensed under the GNU Lesser General Public License (LGPL) version 2.1 or later. However, FFmpeg incorporates several optional parts and optimizations that are covered by the GNU General Public License (GPL) version 2 or later. If those parts get used the GPL applies to all of FFmpeg.”

<http://ffmpeg.org/legal.html>

### Upstream Contact

<http://ffmpeg.org/>

### Type

optional

### Version Information

### Equivalent System Packages

alpine: install the following packages: ffmpeg arch:

```
$ sudo pacman -S ffmpeg
```

conda:

```
$ conda install imageio-ffmpeg
```

Debian/Ubuntu:

```
$ sudo apt-get install ffmpeg
```

Fedora/Redhat/CentOS:

```
$ sudo yum install ffmpeg
```

freebsd:

```
$ sudo pkg install multimedia/ffmpeg
```

homebrew:

```
$ brew install ffmpeg
```

macports: install the following packages: ffmpeg nix:

```
$ nix-env --install ffmpeg
```

opensuse:

```
$ sudo zypper install ffmpeg
```

void:

```
$ sudo xbps-install ffmpeg
```

See <https://repology.org/project/ffmpeg/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.76 filelock: A platform independent file lock

### Description

A platform independent file lock.

### License

Public Domain <<http://unlicense.org>>

### Upstream Contact

<https://pypi.org/project/filelock/>

## Type

standard

## Version Information

package-version.txt:

3.0.12
--------

install-requires.txt:

filelock
----------

## Equivalent System Packages

If the system package is installed, ./configure will check whether it can be used.

## 4.1.77 flint: Fast Library for Number Theory

### Description

FLINT is a C library for doing number theory, maintained by William Hart.

Website: <http://www.flintlib.org>

### License

FLINT is licensed GPL v2+.

### Upstream Contact

- flint-devel Gougle Group (<http://groups.google.co.uk/group/flint-devel>)
- William Hart

## Type

standard

## Version Information

package-version.txt:

2.7.1.p0
----------

## Equivalent System Packages

conda:

```
$ conda install libflint
```

cygwin:

```
$ apt-cyg install libflint-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libflint-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install flint flint-devel
```

freebsd:

```
$ sudo pkg install math/flint2
```

gentoo:

```
$ sudo emerge sci-mathematics/flint[ntl]
```

homebrew:

```
$ brew install flint
```

macports: install the following packages: flint nix:

```
$ nix-env --install flint
```

opensuse:

```
$ sudo zypper install flint-devel
```

void:

```
$ sudo xbps-install flintlib-devel
```

See <https://repology.org/project/flint/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.78 flintqs: Multi-polynomial quadratic sieve for integer factorization

### Description

This is William Hart's GPL'd highly optimized multi-polynomial quadratic sieve for integer factorization:

<http://www.friedspace.com/QS/>

See also <http://www.maths.warwick.ac.uk/~masfaw/preprint.html>

See also the repository: <https://github.com/sagemath/FlintQS>

## Type

standard

## Version Information

package-version.txt:

```
1.0.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S flintqs
```

conda:

```
$ conda install flintqs
```

Debian/Ubuntu:

```
$ sudo apt-get install flintqs
```

freebsd:

```
$ sudo pkg install math/flintqs
```

gentoo:

```
$ sudo emerge sci-mathematics/flintqs
```

nix:

```
$ nix-env --install flintqs
```

See <https://repology.org/project/flintqs/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.79 flit\_core: Distribution-building parts of Flit. See flit package for more information

#### Description

Distribution-building parts of Flit. See flit package for more information



**License****Upstream Contact**

<https://pypi.org/project/flit-core/>

**Type**

standard

**Version Information**

package-version.txt:

3.4.0
-------

install-requires.txt:

flit-core
-----------

**Equivalent System Packages**

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.80 fonttools: Tools to manipulate font files****Description**

Tools to manipulate font files

**License**

MIT

**Upstream Contact**

<https://pypi.org/project/fonttools/>

**Type**

standard

## Version Information

package-version.txt:

```
4.28.4
```

install-requires.txt:

```
fonttools
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.81 fplll: Lattice algorithms, including LLL with floating-point orthogonalization

#### Description

fplll contains implementations of several lattice algorithms. The implementation relies on floating-point orthogonalization, and LLL is central to the code, hence the name.

Website: <https://github.com/fplll/fplll>

#### License

- LGPL V2.1+

#### Upstream Contact

- Martin Albrecht <[martinralbrecht+fplll@gmail.com](mailto:martinralbrecht+fplll@gmail.com)>
- Mailing List <https://groups.google.com/forum/#!forum/fplll-devel>

#### Dependencies

- gmp
- mpfr

#### Type

standard

## Version Information

package-version.txt:

```
5.4.1
```

## Equivalent System Packages

conda:

```
$ conda install fplll
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libfplll libfplll-devel
```

freebsd:

```
$ sudo pkg install math/fplll
```

gentoo:

```
$ sudo emerge sci-libs/fplll
```

homebrew:

```
$ brew install fplll
```

opensuse:

```
$ sudo zypper install "pkgconfig(fplll)"
```

See <https://repology.org/project/fplll/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.82 fpylll: Python interface for FPLLL

### Description

A Python interface for <https://github.com/fplll/fplll> (Lattice algorithms using floating-point arithmetic)

### License

GPL version 2 or later

## Upstream Contact

<https://github.com/fplll/fpylll>

## Dependencies

- Cython
- fplll
- Sage (optional)
- NumPy (optional)

## Type

standard

## Version Information

package-version.txt:

```
0.5.6
```

install-requires.txt:

```
fpylll >=0.5.5, <=0.5.6
```

## Equivalent System Packages

conda:

```
$ conda install fpylll
```

See <https://repology.org/project/fpylll/versions>, <https://repology.org/project/python:fpylll/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.83 freetype: A free, high-quality, and portable font engine

### Description

From the documentation:

FreeType is a software font engine that is designed to be small, efficient, highly customizable, and portable while capable of producing high-quality output (glyph images). It can be used in graphics libraries, display servers, font conversion tools, text image generation tools, and many other products as well.

Note that FreeType is a font service and doesn't provide APIs to perform higher-level features like text layout or graphics processing (e.g., colored text rendering, 'hollowing', etc.). However, it greatly simplifies these tasks by providing a simple, easy to use, and uniform interface to access the content of font files.

Please note that ‘FreeType’ is also called ‘FreeType 2’, to distinguish it from the old, deprecated ‘FreeType 1’ library, a predecessor no longer maintained and supported.

The package in Sage is called freetype (in lowercase).

## License

- FreeType (BSD-like)
- GNU Public License v2

From the documentation:

FreeType is released under two open-source licenses: our own BSD-like FreeType License and the GNU Public License, Version 2. It can thus be used by any kind of projects, be they proprietary or not.

## Upstream Contact

- home: <https://www.freetype.org>
- repo:
  - official: <http://git.savannah.gnu.org/cgit/freetype>
  - mirror: <https://github.com/aseprite/freetype2/>

## Dependencies

See the dependencies file.

## Type

standard

## Version Information

package-version.txt:

```
2.10.4
```

## Equivalent System Packages

conda:

```
$ conda install freetype
```

cygwin:

```
$ apt-cyg install libfreetype-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libfreetype6-dev
```

freebsd:

```
$ sudo pkg install print/freetype2
```

homebrew:

```
$ brew install freetype
```

macports: install the following packages: freetype nix:

```
$ nix-env --install freetype
```

opensuse:

```
$ sudo zypper install "pkgconfig(freetype2)"
```

slackware:

```
$ sudo slackpkg install freetype harfbuzz glib glib2
```

void:

```
$ sudo xbps-install freetype-devel
```

See <https://repology.org/project/freetype/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.84 fricas: A general purpose computer algebra system

### Description

FriCAS is a general purpose computer algebra system.

### License

Modified BSD license.

### Upstream Contact

<http://fricas.sourceforge.net/>

## Dependencies

- ecl

## Type

optional

## Version Information

package-version.txt:

1.3.7.p1
----------

## Equivalent System Packages

macports: install the following packages: fricas See <https://repology.org/project/fricas/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.85 frobby: Computations on monomial ideals

### Description

The software package Frobby provides a number of computations on monomial ideals. The current main feature is the socle of a monomial ideal, which is largely equivalent to computing the maximal standard monomials, the Alexander dual or the irreducible decomposition.

Operations on monomial ideals are much faster than algorithms designed for ideals in general, which is what makes a specialized library for these operations on monomial ideals useful.

### License

- GPL version 2.0 or later

### Upstream Contact

- <http://www.broune.com/frobby/>
- <https://github.com/Macaulay2/frobby>

## Dependencies

- GMP built with support for C++

## Special Update/Build instructions

Download Frobbly at [www.broune.com/](http://www.broune.com/) and then type “make spkg VER=blah” which will create an spkg named frobby-VER.spkg in bin/. The files related to doing this is in the sage/ sub-directory of the Frobbly source distribution.

## Type

optional

## Version Information

package-version.txt:

0.9.0.p2
----------

## Equivalent System Packages

See <https://repology.org/project/frobbly/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.86 gambit: Computations on finite, noncooperative games

### Description

Gambit is a set of software tools for doing computation on finite, noncooperative games. The Gambit Project was founded in the mid-1980s by Richard McKelvey at the California Institute of Technology.

### License

GPL v2+

### Upstream Contact

- Website: <http://www.gambit-project.org/>
- Mailing List: <http://sourceforge.net/p/gambit/mailman/gambit-devel/>



## Dependencies

- python
- cython
- setuptools
- IPython
- scipy

## Type

experimental

## Version Information

package-version.txt:

```
15.1.1.p0
```

## Equivalent System Packages

homebrew:

```
$ brew install gambit
```

See <https://repology.org/project/gambit-game-theory/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.87 gap: Groups, Algorithms, Programming - a system for computational discrete algebra

### Description

GAP is a system for computational discrete algebra, with particular emphasis on Computational Group Theory. GAP provides a programming language, a library of thousands of functions implementing algebraic algorithms written in the GAP language as well as large data libraries of algebraic objects. See also the overview and the description of the mathematical capabilities. GAP is used in research and teaching for studying groups and their representations, rings, vector spaces, algebras, combinatorial structures, and more. The system, including source, is distributed freely. You can study and easily modify or extend it for your special use.

This is a stripped-down version of GAP. The databases, which are architecture-independent, are in a separate package.

## Upstream Contact

<https://www.gap-system.org>

Mailing list at <https://mail.gap-system.org/mailman/listinfo/gap>

## Dependencies

- Readline
- GMP

## Special Update/Build Instructions

This is a stripped-down version of GAP. The downloading of the sources and removal of unneeded parts is done by the script `spkg-src`. When you update GAP, please also update and use the `spkg-src` script.

- Do we really want to copy everything from the build directory???

You need the full GAP tree to compile/install many GAP packages.

- There's apparently a command missing (in `spkg-install`) building the (HTML?) documentation. Earlier changelog entries as well as the description above state the documentation was removed from the upstream sources... Since the (pre-)built HTML documentation is currently included, I've commented out some lines in that part of `spkg-install`. -leif

## Patches

### Type

standard

## Version Information

package-version.txt:

```
4.11.1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S gap
```

conda:

```
$ conda install gap-defaults
```

Debian/Ubuntu:

```
$ sudo apt-get install libgap-dev
```

freebsd:

```
$ sudo pkg install math/gap
```

nix:

```
$ nix-env --install gap
```

See <https://repology.org/project/gap/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.88 gap3: A minimal distribution of GAP 3 containing packages that have no equivalent in GAP 4

#### Description

This package installs Jean Michel's pre-packaged GAP3, which is a minimal GAP3 distribution containing packages that have no equivalent in GAP4.

Below is the full description from Jean Michel's webpage (accessed 23 July 2015).

A pre-packaged GAP3 with everything you need

To help people who are just interested in GAP3 because they need a package which has not been ported to GAP4, I have prepared an easy-to install minimal GAP3 distribution containing an up-to-date versions of the packages:

anusq, arep, autag, chevie, cryst, dce, grim, matrix, meataxe, monoid, nq, pcqa, sisyphe, specht, ve, vkcurve.

These packages have been chosen since most have no equivalent in GAP4. They are autoloading when starting gap.

This distribution includes only partial lists of small groups, 2-groups, 3-groups, character tables from the Atlas and tables of marks. It does not include either the packages:

anupq, grape, kbmag, xgap, cohomolo, gliss, guava, xmod

which have some equivalent in GAP4. You can get these extra features at

<http://www.math.rwth-aachen.de/~Frank.Luebeck/gap/GAP3>

In this distribution:

- The on-line help includes the documentation of the included packages.
- The html documentation (`htm/index.html`) also does.
- The manual (`manual.pdf`) also does.

## License

Most parts of the GAP distribution, including the core part of the GAP system, are distributed under the terms of the GNU General Public License (see <http://www.gnu.org/licenses/gpl.html> or the file GPL in the etc directory of the GAP installation).

## SPKG Maintainers

- Christian Stump <[christian.stump@gmail.com](mailto:christian.stump@gmail.com)>

## Upstream Contact

Jean Michel <[jmichel@math.jussieu.fr](mailto:jmichel@math.jussieu.fr)> <http://webusers.imj-prg.fr/~jean.michel/>

## Special Update/Build Instructions

The difference between the distributed tarball and Jean Michel's original tarball also contains the binaries

## Patches

None

## Dependencies

None

## Type

experimental

## Version Information

package-version.txt:

04jul17
---------

## Equivalent System Packages

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.89 gap\_jupyter: Jupyter kernel for GAP

### Description

Jupyter kernel for GAP

This wrapper-kernel is a Jupyter kernel for the GAP Computer Algebra System based on the same ideas as the bash wrapper kernel.

### License

3-Clause BSD License

### Upstream Contact

- <https://github.com/gap-packages/jupyter-gap>

### Type

optional

### Version Information

package-version.txt:

```
0.9
```

install-requires.txt:

```
gap_jupyter >=0.9
```

### Equivalent System Packages

conda:

```
$ conda install gap
```

See <https://repology.org/project/gap-jupyterkernel/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.90 gap\_packages: A collection of GAP packages

### Description

Several “official” and “undeposited” GAP packages available from <https://www.gap-system.org/Packages/packages.html>

### Upstream Contact

Mailing list at <https://mail.gap-system.org/mailman/listinfo/gap>

### Dependencies

- GAP (a standard spkg)

### TODO

The crystallographic group packages are untested/untestable. They rely on polymake and the dependency “cryst” is missing. This needs to be cleaned up.

### Notes

A brief description of each package follows:

cohomolo - The cohomolo package is a GAP interface to some C programs for computing Schur multipliers and covering groups of finite groups and first and second cohomology groups of finite groups acting on finite modules. (Author: Max Horn, Markus Pfeiffer)

CoReLG - Contains functionality for working with real semisimple Lie algebras. (Author: Heiko Dietrich, Paolo Faccin, Willem Adriaan de Graaf)

crime - package to compute the cohomology ring of finite p-groups, induced maps, and Massey products. (Author: Marcus Bishop)

cryst - Computing with crystallographic groups (Authors: Bettina Eick, Franz Gähler, Werner Nickel)

CTblLib - The GAP Character Table Library (Author: Thomas Breuer)

DESIGN is a package for classifying, partitioning and studying block designs. (Author: Leonard H. Soicher)

FactInt is a package providing routines for factoring integers, in particular:

- Pollard’s p-1
- Williams’ p+1
- Elliptic Curves Method (ECM)
- Continued Fraction Algorithm (CFRAC)
- Multiple Polynomial Quadratic Sieve (MPQS)

(Author: Stefan Kohl)

GAPDoc is a package containing a definition of a structure for GAP documentation, based on XML. It also contains conversion programs for producing text-, DVI-, PDF- or HTML-versions of such documents, with hyperlinks if possible. (Authors: Frank Luebeck, Max Neunhoeffler)

GBNP - The GBNP package provides algorithms for computing Grobner bases of noncommutative polynomials with coefficients from a field implemented in GAP and with respect to the “total degree first then lexicographical” ordering. Further provided are some variations, such as a weighted and truncated version and a tracing facility. The word “algorithm” is to be interpreted loosely here: in general one cannot expect such an algorithm to terminate, as it would imply solvability of the word problem for finitely presented (semi)groups. (Authors: A.M. Cohen, J.W. Knopper)

GRAPE is a package for computing with graphs and groups, and is primarily designed for constructing and analysing graphs related to groups, finite geometries, and designs. (Author: Leonard H. Soicher)

GUAVA is included here, and with Sage standard.

HAP (Homological Algebra Programming) is a GAP package providing some functions for group cohomology computation. (Author: Graham Ellis)

HAPcryst - an extension package for HAP, which allows for group cohomology computation for a wider class of groups. (Author: Marc Roeder)

hecke - Provides functions for calculating decomposition matrices of Hecke algebras of the symmetric groups and  $q$ -Schur algebras. Hecke is a port of the GAP 3 package Specht 2.4 to GAP 4. (Author: Dmitriy Traytel)

LAGUNA - this package provides functionality for calculation of the normalized unit group of the modular group algebra of the finite  $p$ -group and for investigation of Lie algebra associated with group algebras and other associative algebras. (Authors :Victor Bovdi, Alexander Konovalov, Richard Rossmanith, Csaba Schneider)

liealgdb - A database of Lie algebras (Author: Serena Cicalo', Willem Adriaan de Graaf, Csaba Schneider)

LiePRing - Database and algorithms for Lie  $p$ -rings (Author: Michael Vaughan-Lee, Bettina Eick)

LieRing - contains functionality for working with finitely presented Lie rings and the Lazard correspondence. (Author: Serena Cicalo', Willem Adriaan de Graaf)

loops - Provides researchers in nonassociative algebra with a computational tool that integrates standard notions of loop theory with libraries of loops and group-theoretical algorithms of GAP. The package also expands GAP toward nonassociative structures. (Authors: Gabor Nagy, Petr Vojtechovsky)

mapclass - The package calculates the mapping class group orbits for a given finite group. (Authors: Adam James, Kay Magaard, Sergey Shpectorov, Helmut Volklein)

polymake - an interface with the (standalone) polymake program used by HAPcryst. (Author: Marc Roeder)

qpa - Quivers and Path Algebras provides data structures and algorithms for doing computations with finite dimensional quotients of path algebras, and finitely generated modules over such algebras. The current version of the QPA package has data structures for quivers, quotients of path algebras, and modules, homomorphisms and complexes of modules over quotients of path algebras. (Authors: Edward Green, Oeyvind Solberg)

quagroup - Contains functionality for working with quantized enveloping algebras of finite-dimensional semisimple Lie algebras. (Author: Willem Adriaan de Graaf)

reprsn - The package provides GAP functions for computing characteristic zero matrix representations of finite groups. (Author: Vahid Dabbaghian)

sla - a package for doing computations with simple Lie algebras (Author: Willem Adriaan de Graaf)

SONATA (“System Of Nearrings And Their Applications”) is a package which constructs finite nearrings and related objects. (Authors: Erhard Aichinger, Franz Binder, Jürgen Ecker, Peter Mayr, Christof Noebauer)

TORIC is a GAP package for computing with toric varieties. (Author: David Joyner)

## Type

optional

## Version Information

package-version.txt:

```
4.11.1
```

## Equivalent System Packages

conda:

```
$ conda install gap
```

See <https://repology.org/project/gap/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.91 gast: Python AST that abstracts the underlying Python version

### Description

Python AST that abstracts the underlying Python version

### License

BSD 3-Clause

### Upstream Contact

<https://pypi.org/project/gast/>

## Type

standard

## Version Information

package-version.txt:

```
0.5.2
```

install-requires.txt:

```
gast
```



## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.92 gc: The Boehm-Demers-Weiser conservative garbage collector

#### Description

The Boehm-Demers-Weiser conservative garbage collector.

#### License

- Permissive BSD + GPL 2.0+

#### Upstream Contact

Webpage: <http://www.hboehm.info/gc/>

Email List: [bdwgc@lists.opendylan.org](mailto:bdwgc@lists.opendylan.org)

#### Dependencies

None.

#### Special Update/Build Instructions

None.

#### Patches

- cygwin64.patch: let libgc build on Cygwin64.

#### Type

standard

#### Version Information

package-version.txt:

8.0.4
-------

## Equivalent System Packages

arch:

```
$ sudo pacman -S gc
```

conda:

```
$ conda install bdw-gc
```

cygwin:

```
$ apt-cyg install libgc-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libgc-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gc gc-devel
```

freebsd:

```
$ sudo pkg install devel/boehm-gc devel/boehm-gc-threaded
```

gentoo:

```
$ sudo emerge dev-libs/boehm-gc
```

homebrew:

```
$ brew install bdw-gc
```

macports: install the following packages: boehm-gc opensuse:

```
$ sudo zypper install "pkgconfig(bdw-gc)"
```

slackware:

```
$ sudo slackpkg install gc
```

void:

```
$ sudo xbps-install gc-devel
```

See <https://repology.org/project/boehm-gc/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.93 gcc: The GNU Compiler Collection, including the C, C++ and Fortran compiler

#### Description

The GNU Compiler Collection, including the C, C++ and Fortran compiler.

#### License

GPL version 2 or version 3

#### Upstream Contact

<https://gcc.gnu.org/>

#### Type

standard

#### Version Information

package-version.txt:

```
10.3.0
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S gcc
```

cygwin:

```
$ apt-cyg install gcc-core gcc-g++ gcc-fortran
```

Debian/Ubuntu:

```
$ sudo apt-get install gcc g++
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gcc gcc-c++ gcc-gfortran
```

freebsd:

```
$ sudo pkg install lang/gcc9
```

homebrew:

```
$ brew install gcc
```

opensuse:

```
$ sudo zypper install gcc-c++
```

void:

```
$ sudo xbps-install gcc
```

See <https://repology.org/project/gcc/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.94 gdb: The GNU Project debugger

### Description

GDB, the GNU Project debugger, allows you to see what is going on “inside” another program while it executes – or what another program was doing at the moment it crashed.

### License

GPL v3+

### Upstream Contact

<http://www.gnu.org/software/gdb/>

### Special Update/Build Instructions

Current version needs makeinfo installed to build successfully.

### Type

experimental

### Version Information

package-version.txt:

```
8.2
```

## Equivalent System Packages

conda:

```
$ conda install gdb
```

homebrew:

```
$ brew install gdb
```

macports: install the following packages: gdb opensuse:

```
$ sudo zypper install gdb
```

See <https://repology.org/project/gdb/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.95 gengetopt: getopt\_long parser generator

#### Description

GNU Gengetopt converts a textual description of your program's arguments and options into a getopt\_long() parser in C (or C++).

Website: <https://www.gnu.org/software/gengetopt/>

#### License

GPL-3+ (<https://www.gnu.org/software/gengetopt/LICENSE>)

#### Type

standard

#### Version Information

package-version.txt:

```
2.23
```

## Equivalent System Packages

conda:

```
$ conda install gengetopt
```

cygwin:

```
$ apt-cyg install gengetopt
```

Debian/Ubuntu:

```
$ sudo apt-get install gengetopt
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gengetopt
```

gentoo:

```
$ sudo emerge dev-util/gengetopt
```

homebrew:

```
$ brew install gengetopt
```

nix:

```
$ nix-env --install gengetopt
```

void:

```
$ sudo xbps-install gengetopt
```

See <https://repology.org/project/gengetopt/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.96 gf2x: Fast arithmetic in $\text{GF}(2)[x]$ and searching for irreducible/primitive trinomials

### Description

gf2x is a C/C++ software package containing routines for fast arithmetic in  $\text{GF}(2)[x]$  (multiplication, squaring, GCD) and searching for irreducible/primitive trinomials.

Website: <http://gf2x.gforge.inria.fr/>

### License

- GNU GPLv2+.

### Upstream Contact

- Richard Brent
- Pierrick Gaudry
- Emmanuel Thomé
- Paul Zimmermann

## Dependencies

- None

## Special Update/Build Instructions

- As some patches touch `config/acinclude.m4`, we have to touch `aclocal.m4`, `configure`, `Makefile.in` and `gf2x/gf2x-config.h.in` to prevent autotools to try to regenerate these files.

## Patches

- 0001-Trac-15014-Let-gf2x-build-a-shared-library-on-Cygwin.patch: pass `-no-undefined` flag to `libtool`.
- 0002-tr-portability.patch: backport upstream fix for non-portable `tr` use
- 0003-Improve-detection-of-sse2-support.patch: backport upstream improved check for `sse2`
- 0004-Add-disable-hardware-specific-code.patch: add option `-disable-hardware-specific-code` to build system. This is partly backported from upstream.
- 0005-Update-autotooled-files.patch: the above patches make changes to code used by autotools for generation of the build system. This patches those files, so that autotools need not be installed.
- 0006-Fix\_make\_check\_not\_failing\_on\_errors.patch: (upstream patch) Fix bug in shell script such that `'make check'` always fails upon errors.

## Type

standard

## Version Information

package-version.txt:

```
1.3.0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S gf2x
```

conda:

```
$ conda install gf2x
```

Debian/Ubuntu:

```
$ sudo apt-get install libgf2x-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gf2x gf2x-devel
```

freebsd:

```
$ sudo pkg install math/gf2x
```

opensuse:

```
$ sudo zypper install "pkgconfig(gf2x)"
```

void:

```
$ sudo xbps-install gf2x-devel
```

See <https://repology.org/project/gf2x/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.97 gfan: Groebner fans and tropical varieties

### Description

Gfan is a software package for computing Groebner fans and tropical varieties.

These are polyhedral fans associated to polynomial ideals. The maximal cones of a Groebner fan are in bijection with the marked reduced Groebner bases of its defining ideal. The software computes all marked reduced Groebner bases of an ideal. Their union is a universal Groebner basis. The tropical variety of a polynomial ideal is a certain subcomplex of the Groebner fan. Gfan contains algorithms for computing this complex for general ideals and specialized algorithms for tropical curves, tropical hypersurfaces and tropical varieties of prime ideals. In addition to the above core functions the package contains many tools which are useful in the study of Groebner bases, initial ideals and tropical geometry. The full list of commands can be found in Appendix B of the manual. For ordinary Groebner basis computations Gfan is not competitive in speed compared to programs such as CoCoA, Singular and Macaulay2.

### License

- GPL version 2 or version 3 (according to the gfan website)

### Upstream Contact

Anders Nedergaard Jensen

<https://users-math.au.dk/jensen/software/gfan/gfan.html>



## Special Update/Build Instructions

Remove the doc, homepage, and examples subdirectories, which take up most of the space.

## Type

standard

## Version Information

package-version.txt:

```
0.6.2.p1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S gfan
```

conda:

```
$ conda install gfan
```

Debian/Ubuntu:

```
$ sudo apt-get install gfan
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gfan
```

freebsd:

```
$ sudo pkg install math/gfan
```

gentoo:

```
$ sudo emerge sci-mathematics/gfan
```

nix:

```
$ nix-env --install gfan
```

opensuse:

```
$ sudo zypper install gfan
```

See <https://repology.org/project/gfan/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.98 gfortran: Fortran compiler from the GNU Compiler Collection

### Description

The GNU Compiler Collection, including the C, C++ and Fortran compiler. This particular package is meant to only make gfortran available.

### License

GPL version 2 or version 3

### Upstream Contact

<http://gcc.gnu.org/>

### Dependencies

- zlib
- GMP
- MPFR
- MPC

### Special Update/Build Instructions

None.

### Type

standard

### Version Information

package-version.txt:

```
10.3.0
```

### Equivalent System Packages

arch:

```
$ sudo pacman -S gcc-fortran
```

conda:

```
$ conda install fortran-compiler
```

cygwin:

```
$ apt-cyg install gcc-fortran
```

Debian/Ubuntu:

```
$ sudo apt-get install gfortran
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gcc-gfortran
```

freebsd:

```
$ sudo pkg install lang/gcc9
```

homebrew:

```
$ brew install gfortran
```

macports: install the following packages: gcc10 +gfortran opensuse:

```
$ sudo zypper install gcc-fortran
```

slackware:

```
$ sudo slackpkg install gcc-gfortran
```

void:

```
$ sudo xbps-install gcc-fortran
```

See <https://repology.org/project/gfortran/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.99 giac: A general purpose computer algebra system

### Description

- Giac is a general purpose Computer algebra system by Bernard Parisse. It consists of:
- a C++ library (libgiac).
- a command line interpreter (icas or giac).
- the built of the FLTK-based GUI (xcas) has been disabled in the spkg-install file.
- The english documentation will be installed in:  
\$SAGE\_LOCAL/share/giac/doc/en/cascmd\_en/index.html
- Author's website with debian, ubuntu, macosx, windows package:  
<http://www-fourier.ujf-grenoble.fr/~parisse/giac.html>
- The FreeBSD port is math/giacxcas

## Licence

GPLv3+

Note: except the french html documentation which is freely redistributable for non commercial only purposes. This doc has been removed in the Sage package, see spkg-src

## Upstream Contact

- Bernard Parisse: <http://www-fourier.ujf-grenoble.fr/~parisse/giac.html>
- Source file (giac-x.y.z-t.tar.gz) in:  
<http://www-fourier.ujf-grenoble.fr/~parisse/debian/dists/stable/main/source/>

## Dependencies

- gettext, readline
- giac will benefit of ntl, pari, mpfr, gsl, lapack but they should be already installed by sage.
- giac can also benefit of mpfi for arithmetic on intervals.
- The Documentation is pre-built, hevea or latex or ... are not needed to install the package.

## Special Update/Build Instructions

- Use spkg-src to update this package

## Type

standard

## Version Information

package-version.txt:

```
1.6.0.47p3
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S libgiac giac
```

conda:

```
$ conda install giac
```

Debian/Ubuntu:

```
$ sudo apt-get install libgiac-dev xcas
```

Fedora/Redhat/CentOS:

```
$ sudo yum install giac giac-devel
```

freebsd:

```
$ sudo pkg install math/giacxcas
```

nix:

```
$ nix-env --install giac
```

opensuse:

```
$ sudo zypper install giac-devel
```

void:

```
$ sudo xbps-install giac-devel
```

See <https://repology.org/project/giac/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.100 git: Version control system

### Description

Git is a fast, scalable, distributed revision control system with an unusually rich command set that provides both high-operations and full access to internals.

- `man git`

### Upstream Contact

- Website: <https://git-scm.com/>

### Type

optional

### Version Information

### Equivalent System Packages

conda:

```
$ conda install git
```

cygwin:

```
$ apt-cyg install git
```

Debian/Ubuntu:

```
$ sudo apt-get install git
```

Fedora/Redhat/CentOS:

```
$ sudo yum install git
```

freebsd:

```
$ sudo pkg install devel/git
```

homebrew:

```
$ brew install git
```

macports: install the following packages: git opensuse:

```
$ sudo zypper install git
```

slackware:

```
$ sudo slackpkg install git
```

void:

```
$ sudo xbps-install git
```

See <https://repology.org/project/git/versions>

If the system package is installed, ./configure will check whether it can be used.

### **4.1.101 givaro: C++ library for arithmetic and algebraic computations**

#### **Description**

Givaro is a C++ library for arithmetic and algebraic computations. Its main features are implementations of the basic arithmetic of many mathematical entities: Primes fields, Extensions Fields, Finite Fields, Finite Rings, Polynomials, Algebraic numbers, Arbitrary precision integers and rationals (C++ wrappers over gmp) It also provides data-structures and templated classes for the manipulation of basic algebraic objects, such as vectors, matrices (dense, sparse, structured), univariate polynomials (and therefore recursive multivariate).

Website: <https://casys.gricad-pages.univ-grenoble-alpes.fr/givaro/>

SPKG Repository: <https://bitbucket.org/malb/givaro-spkg>

## License

- GNU GPL

## Upstream Contact

- Clement Pernet

## Type

standard

## Version Information

package-version.txt:

```
4.1.1
```

## Equivalent System Packages

conda:

```
$ conda install givaro
```

Debian/Ubuntu:

```
$ sudo apt-get install libgivaro-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install givaro givaro-devel
```

freebsd:

```
$ sudo pkg install math/givaro
```

gentoo:

```
$ sudo emerge sci-libs/givaro
```

nix:

```
$ nix-env --install givaro
```

opensuse:

```
$ sudo zypper install "pkgconfig(givaro)"
```

See <https://repology.org/project/givaro/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.102 glpk: GNU Linear Programming Kit

#### Description

The GLPK (GNU Linear Programming Kit) package is intended for solving large-scale linear programming (LP), mixed integer programming (MIP), and other related problems. It is a set of routines written in ANSI C and organized in the form of a callable library.

GLPK supports the GNU MathProg modelling language, which is a subset of the AMPL language.

The GLPK package includes the following main components:

- primal and dual simplex methods
- primal-dual interior-point method
- branch-and-cut method
- translator for GNU MathProg
- application program interface (API)
- stand-alone LP/MIP solver

#### License

The GLPK package is GPL version 3.

#### Upstream Contact

GLPK is currently being maintained by:

- Andrew Makhorin ([mao@gnu.org](mailto:mao@gnu.org), [mao@mai2.rcnet.ru](mailto:mao@mai2.rcnet.ru))

<http://www.gnu.org/software/glpk/#maintainer>

#### Special Update/Build Instructions

- `configure` doesn't support specifying the location of the GMP library to use; only `--with-gmp[=yes]` or `--with-gmp=no` are valid options. (So we \*have to\* add Sage's include and library directories to `CPPFLAGS` and `LDFLAGS`, respectively.)
- Do we need the `--disable-static`? The stand-alone solver presumably runs faster when built with a static library; also other (stand-alone) programs using it would. (Instead, we should perhaps use `--enable-static` `--enable-shared` to go safe.)

#### Patches

- All patches below are currently used by `spkg-src`
- `src/01-zlib.patch`: don't build the included `zlib` library.
- `src/02-cygwin_sharedlib.patch`: Let a shared library be built on Cygwin by passing the `-no-undefined` flag to `libtool`.

The numbering reflect the order in which they have been created from `glpk` pristine's sources



## Type

standard

## Version Information

package-version.txt:

```
5.0.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S glpk
```

conda:

```
$ conda install glpk
```

cygwin:

```
$ apt-cyg install glpk libglpk-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install glpk-utils libglpk-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install glpk glpk-devel glpk-utils
```

freebsd:

```
$ sudo pkg install math/glpk
```

gentoo:

```
$ sudo emerge sci-mathematics/glpk
```

homebrew:

```
$ brew install glpk
```

macports: install the following packages: glpk nix:

```
$ nix-env --install glpk
```

opensuse:

```
$ sudo zypper install glpk glpk-devel
```

void:

```
$ sudo xbps-install glpk-devel
```

See <https://repology.org/project/glpk/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.103 glucose: A SAT solver

#### Description

Glucose is a SAT solver.

Citing its website:

The name of the solver is a contraction of the concept of “glue clauses”, a particular kind of clauses that glucose detects and preserves during search. Glucose is heavily based on Minisat, so please do cite Minisat also if you want to cite Glucose.

#### License

- nonparallel glucose: MIT
- parallel glucose-syrup: MIT modified with:

The parallel version of Glucose (all files modified since Glucose 3.0 releases, 2013) cannot be used in any competitive event (sat competitions/evaluations) without the express permission of the authors (Gilles Audemard / Laurent Simon). This is also the case for any competitive event using Glucose Parallel as an embedded SAT engine (single core or not).

#### Upstream Contact

Website: <http://www.labri.fr/perso/lsimon/glucose/>

#### Dependencies

zlib

#### Special Update/Build Instructions

None.

#### Type

optional

## Version Information

package-version.txt:

```
4.1
```

## Equivalent System Packages

See <https://repology.org/project/glucose/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.104 gmp: Library for arbitrary precision arithmetic

#### Description

GMP is a free library for arbitrary precision arithmetic, operating on signed integers, rational numbers, and floating-point numbers. There is no practical limit to the precision except the ones implied by the available memory in the machine GMP runs on. GMP has a rich set of functions, and the functions have a regular interface.

#### License

- LGPL V3

#### Upstream Contact

- <http://gmplib.org>

#### Type

standard

## Version Information

package-version.txt:

```
6.2.1
```

## Equivalent System Packages

conda:

```
$ conda install gmp
```

cygwin:

```
$ apt-cyg install libgmp-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libgmp-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gmp gmp-devel
```

freebsd:

```
$ sudo pkg install math/gmp
```

gentoo:

```
$ sudo emerge dev-libs/gmp
```

homebrew:

```
$ brew install gmp
```

macports: install the following packages: gmp opensuse:

```
$ sudo zypper install gmp-devel
```

slackware:

```
$ sudo slackpkg install gmp
```

void:

```
$ sudo xbps-install gmpxx-devel
```

See <https://repology.org/project/gmp/versions>

If the system package is installed, ./configure will check whether it can be used.

## **4.1.105 gmpy2: Python interface to GMP/MPIR, MPFR, and MPC**

### **Description**

GMP/MPIR, MPFR, and MPC interface to Python 2.6+ and 3.x

gmpy2 is a C-coded Python extension module that supports multiple-precision arithmetic. In addition to supporting GMP or MPIR for multiple-precision integer and rational arithmetic, gmpy2 adds support for the MPFR (correctly rounded real floating-point arithmetic) and MPC (correctly rounded complex floating-point arithmetic) libraries.

## Type

standard

## Version Information

package-version.txt:

```
2.1.0rc1
```

install-requires.txt:

```
# We would like to write gmpy2 >=2.1.0b5, but pipenv does not accept prereleases in ↵
↵version ranges
# https://github.com/pypa/pipenv/issues/1760
gmpy2 ==2.1.0rc1
```

## Equivalent System Packages

conda:

```
$ conda install gmpy2
```

macports: install the following packages: py-gmpy2 See <https://repology.org/project/python:gmpy2/versions>, <https://repology.org/project/python:gmpy2-devel/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.106 gp2c: A compiler for translating GP routines to C

### Description

The gp2c compiler is a package for translating GP routines into the C programming language, so that they can be compiled and used with the PARI system or the GP calculator.

### License

GPL version 2+

### Upstream Contact

- <http://pari.math.u-bordeaux.fr/>

## Dependencies

- PARI
- Perl

## Type

optional

## Version Information

package-version.txt:

```
0.0.10.p0
```

## Equivalent System Packages

Debian/Ubuntu:

```
$ sudo apt-get install pari-gp2c
```

freebsd:

```
$ sudo pkg install math/gp2c
```

gentoo:

```
$ sudo emerge sci-mathematics/gp2c
```

opensuse:

```
$ sudo zypper install gp2c
```

void:

```
$ sudo xbps-install gp2c
```

See <https://repology.org/project/gp2c/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.107 graphs: A database of combinatorial graphs

### Description

A database of graphs. Created by Emily Kirkman based on the work of Jason Grout. Since April 2012 it also contains the ISGCI graph database.

## Upstream Contact

- [https://jasongrout.org/graph\\_database](https://jasongrout.org/graph_database)
- For ISGCI:  
H.N. de Ridder ([hnridder@graphclasses.org](mailto:hnridder@graphclasses.org))
- For Andries Brouwer's database:

The data is taken from from Andries E. Brouwer's website (<https://www.win.tue.nl/~aeb/>). Anything related to the data should be reported to him directly ([aeb@cw.nl](mailto:aeb@cw.nl))

The code used to parse the data and create the .json file is available at [https://github.com/nathanncohen/strongly\\_regular\\_graphs\\_database](https://github.com/nathanncohen/strongly_regular_graphs_database).

## Dependencies

N/A

## Type

standard

## Version Information

package-version.txt:

```
20210214.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S sage-data-graphs
```

conda:

```
$ conda install sagemath-db-graphs
```

See <https://repology.org/project/sagemath-graphs/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.108 graphviz: Graph visualization software

### Description

Graphviz is open source graph visualization software. It has several main graph layout programs. They take descriptions of graphs in a simple text language, and make diagrams in several useful formats.

### License

Eclipse Public License 1.0

### Upstream Contact

<https://graphviz.org/about/>

### Type

optional

### Version Information

#### Equivalent System Packages

alpine: install the following packages: graphviz-dev arch:

```
$ sudo pacman -S graphviz
```

conda:

```
$ conda install graphviz
```

cygwin:

```
$ apt-cyg install graphviz
```

Debian/Ubuntu:

```
$ sudo apt-get install graphviz
```

Fedora/Redhat/CentOS:

```
$ sudo yum install graphviz
```

freebsd:

```
$ sudo pkg install graphics/graphviz
```

homebrew:

```
$ brew install graphviz
```

macports: install the following packages: graphviz nix:



```
$ nix-env --install graphviz
```

opensuse:

```
$ sudo zypper install graphviz
```

void:

```
$ sudo xbps-install graphviz
```

See <https://repology.org/project/graphviz/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.109 gsl: The GNU Scientific Library

### Description

The GNU Scientific Library

Website: <http://www.gnu.org/software/gsl/>

From the website above: The GNU Scientific Library (GSL) is a numerical library for C and C++ programmers. It is free software under the GNU General Public License.

The library provides a wide range of mathematical routines such as random number generators, special functions and least-squares fitting. There are over 1000 functions in total with an extensive test suite. If the variable SAGE\_CHECK is exported to the value “yes” when building Sage, GSL’s test suite is run.

### License

- GPL V3

### Upstream Contact

- <http://www.gnu.org/software/gsl/>

GSL mailing lists:

- Bug-gsl <[bug-gsl@gnu.org](mailto:bug-gsl@gnu.org)> mailing list – bug reports for the GNU Scientific Library should be sent to [bug-gsl@gnu.org](mailto:bug-gsl@gnu.org)
- Help-gsl <[help-gsl@gnu.org](mailto:help-gsl@gnu.org)> users mailing list – for questions about installation, how GSL works and how it is used, or general questions concerning GSL.
- Info-gsl <[info-gsl@gnu.org](mailto:info-gsl@gnu.org)> mailing list – announcements of new releases are made there.

## Dependencies

- None - GSL does not depend on any other Sage package to compile, link and pass all of GSL's self-tests. Despite that fact, BLAS is listed as a dependency. (It comes with its own CBLAS implementation that is e.g. used when running the GSL test suite during installation; however, the Sage library only uses it as a fall-back, if e.g. BLAS library is not present.)

## Special Update/Build Instructions

### Type

standard

### Version Information

package-version.txt:

```
2.7
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S gsl
```

conda:

```
$ conda install gsl
```

cygwin:

```
$ apt-cyg install libgsl-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libgsl-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gsl gsl-devel
```

freebsd:

```
$ sudo pkg install math/gsl
```

gentoo:

```
$ sudo emerge sci-libs/gsl
```

homebrew:

```
$ brew install gsl
```

macports: install the following packages: gsl nix:

```
$ nix-env --install gsl
```

opensuse:

```
$ sudo zypper install "pkgconfig(gsl)"
```

slackware:

```
$ sudo slackpkg install gsl
```

void:

```
$ sudo xbps-install  gsl-devel
```

See <https://repology.org/project/gsl/versions>

If the system package is installed, ./configure will check whether it can be used.

### **4.1.110 html5lib: An HTML parser**

#### **Description**

HTML parser based on the WHATWG HTML specification.

#### **License**

MIT License

#### **Upstream Contact**

Home Page: <https://github.com/html5lib/html5lib-python/issues>

#### **Dependencies**

Python, webencodings, six

#### **Type**

standard

## Version Information

package-version.txt:

```
1.1
```

install-requires.txt:

```
html5lib >=1.0.1
```

## Equivalent System Packages

conda:

```
$ conda install html5lib
```

macports: install the following packages: py-html5lib See <https://repology.org/project/html5lib/versions>, <https://repology.org/project/python:html5lib/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.111 iconv: Library for language/country-dependent character encodings

#### Description

GNU libiconv is a library that is used to enable different languages, with different characters to be handled properly.

#### License

- GPL 3 and LGPL 3. So we can safely link against the library in Sage.

#### Upstream Contact

- <http://www.gnu.org/software/libiconv/>
- Bug reports to [bug-gnu-libiconv@gnu.org](mailto:bug-gnu-libiconv@gnu.org)

#### Dependencies

- None for the purposes of Sage, but in general gettext.

### Special Update/Build Instructions

- None, other than anyone updating this package should be familiar with how to write shell scripts.

### Type

standard

### Version Information

package-version.txt:

```
1.15
```

### Equivalent System Packages

cygwin:

```
$ apt-cyg install libiconv-devel
```

homebrew:

```
$ brew install libiconv
```

macports: install the following packages: libiconv See <https://repology.org/project/libiconv/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.112 idna: Internationalized Domain Names in Applications (IDNA)

### Description

Internationalized Domain Names in Applications (IDNA)

### License

BSD-3-Clause

### Upstream Contact

<https://pypi.org/project/idna/>

## Type

standard

## Version Information

package-version.txt:

3.2
-----

install-requires.txt:

idna
------

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.113 igraph: A library for creating and manipulating graphs

### Description

igraph is a library for creating and manipulating graphs. It is intended to be as powerful (ie. fast) as possible to enable the analysis of large graphs.

### License

GPL version 2

### Upstream Contact

<http://igraph.org/c/>

### Dependencies

- GMP/MPIR
- libxml2, but this is not shipped with Sage, so the user has to install libxml2-dev from her distro.

## Special Update/Build Instructions

### Type

optional

### Version Information

package-version.txt:

```
0.8.3
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S igraph
```

conda:

```
$ conda install igraph
```

Debian/Ubuntu:

```
$ sudo apt-get install libigraph-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install igraph igraph-devel
```

freebsd:

```
$ sudo pkg install math/igraph
```

gentoo:

```
$ sudo emerge dev-libs/igraph
```

homebrew:

```
$ brew install igraph
```

macports: install the following packages: igraph See <https://repology.org/project/igraph/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.114 ImageMagick: A collection of tools and libraries for many image file formats

#### Description

A collection of tools and libraries for many image file formats

#### License

Copyright [yyyy] [name of copyright owner]

Licensed under the ImageMagick License (the “License”); you may not use this file except in compliance with the License. You may obtain a copy of the License at

<https://imagemagick.org/script/license.php>

Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an “AS IS” BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.

#### Upstream Contact

<http://www.imagemagick.org/>

#### Type

optional

#### Version Information

#### Equivalent System Packages

alpine: install the following packages: imagemagick arch:

```
$ sudo pacman -S  imagemagick
```

conda:

```
$ conda install imagemagick
```

cygwin:

```
$ apt-cyg install ImageMagick
```

Debian/Ubuntu:

```
$ sudo apt-get install  imagemagick
```

Fedora/Redhat/CentOS:

```
$ sudo yum install  ImageMagick
```

freebsd:



```
$ sudo pkg install graphics/ImageMagick7
```

homebrew:

```
$ brew install imagemagick
```

macports: install the following packages: ImageMagick nix:

```
$ nix-env --install imagemagick
```

opensuse:

```
$ sudo zypper install ImageMagick
```

void:

```
$ sudo xbps-install ImageMagick
```

See <https://repology.org/project/imagemagick/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.115 imagesize: Parser for image file metadata

#### Description

It parses image files' header and return image size.

#### Type

standard

#### Version Information

package-version.txt:

```
1.2.0
```

install-requires.txt:

```
imagesize >=1.1.0
```

#### Equivalent System Packages

conda:

```
$ conda install imagesize
```

macports: install the following packages: py-imagesize See <https://repology.org/project/python:imagesize/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.116 iml: Integer Matrix Library

#### Description

IML is a free library of C source code which implements algorithms for computing exact solutions to dense systems of linear equations over the integers. IML is designed to be used with the ATLAS/BLAS library and GMP bignum library.

Written in portable C, IML can be used on both 32-bit and 64-bit machines. It can be called from C++.

Website: <https://www.cs.uwaterloo.ca/~astorjoh/iml.html>

#### License

- GPLv2+

#### Upstream Contact

- Zhuliang Chen [z4chen@uwaterloo.ca](mailto:z4chen@uwaterloo.ca)
- Arne Storjohann [astorjoh@uwaterloo.ca](mailto:astorjoh@uwaterloo.ca)

#### Dependencies

- GMP
- a BLAS implementation such as openblas

#### Special Update/Build Instructions

- As of version 1.0.4, you need to repackage the upstream tarball using the spkg-src script because there was a bugfix version of 1.0.4 reposted upstream without version number bump.

#### Patches

- examples.patch: Modified some of the examples.

#### Type

standard

#### Version Information

package-version.txt:

1.0.4p2.p2
------------

## Equivalent System Packages

arch:

```
$ sudo pacman -S iml
```

conda:

```
$ conda install iml
```

Debian/Ubuntu:

```
$ sudo apt-get install libiml-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install iml iml-devel
```

freebsd:

```
$ sudo pkg install math/impl
```

gentoo:

```
$ sudo emerge sci-libs/impl
```

nix:

```
$ nix-env --install iml
```

opensuse:

```
$ sudo zypper install iml-devel
```

See <https://repology.org/project/impl/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.117 importlib\_metadata: Library to access the metadata for a Python package

### Description

importlib\_metadata is a library to access the metadata for a Python package. It is intended to be ported to Python 3.8.

### License

Apache Software License

## Upstream Contact

Home page: <http://importlib-metadata.readthedocs.io/>

## Dependencies

Python, Setuptools, zipp

## Type

standard

## Version Information

package-version.txt:

```
4.8.2
```

install-requires.txt:

```
importlib_metadata >=1.7.0
```

## Equivalent System Packages

conda:

```
$ conda install importlib_metadata
```

See <https://repology.org/project/python:importlib-metadata/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.118 importlib\_resources: Read resources from Python packages

### Description

Read resources from Python packages

### License

Apache2

### Upstream Contact

<https://pypi.org/project/importlib-resources/>

### Type

standard

### Version Information

package-version.txt:

5.2.2
-------

install-requires.txt:

importlib-resources
---------------------

### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.119 info: stand-alone Info documentation reader

### Description

GNU Info is the stand-alone “info” reader that is part of the GNU Texinfo suite of tools. Several packages (Maxima, Singular, ...) install documentation in “info” format, which can be read either with Emacs, the stand-alone “info” reader, and some other software. In particular, the interactive help system of `singular_console()` uses the `info` program in environments in which a web browser is not available; if `info` is not installed, it falls back to a basic pager with limited capabilities.

Website: <https://www.gnu.org/software/texinfo/manual/info-std/info-std.html>

### License

GPL-3+ (info/\*.c comments in the source repository)

### Type

optional

## Version Information

package-version.txt:

```
6.8
```

## Equivalent System Packages

conda:

```
$ conda install texinfo
```

cygwin:

```
$ apt-cyg install info
```

Debian/Ubuntu:

```
$ sudo apt-get install texinfo
```

Fedora/Redhat/CentOS:

```
$ sudo yum install texinfo
```

gentoo:

```
$ sudo emerge sys-apps/texinfo
```

homebrew:

```
$ brew install texinfo
```

macports: install the following packages: texinfo nix:

```
$ nix-env --install texinfo
```

opensuse:

```
$ sudo zypper install texinfo
```

void:

```
$ sudo xbps-install texinfo
```

See <https://repology.org/project/texinfo/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.120 ipykernel: IPython Kernel for Jupyter

#### Description

This package provides the IPython kernel for Jupyter.

#### Type

standard

#### Version Information

package-version.txt:

```
6.6.0
```

install-requires.txt:

```
ipykernel >=5.2.1
```

#### Equivalent System Packages

conda:

```
$ conda install ipykernel
```

macports: install the following packages: py-ipykernel See <https://repology.org/project/python:ipykernel/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.121 ipympl: Matplotlib Jupyter Extension

#### Description

Matplotlib Jupyter Extension

#### License

BSD License

## Upstream Contact

<https://pypi.org/project/ipymp1/>

## Type

optional

## Version Information

package-version.txt:

0.7.0

install-requires.txt:

ipymp1

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.122 ipython: Interactive computing environment with an enhanced interactive Python shell

### Description

Interactive computing environment with an enhanced interactive Python shell

From the IPython website:

IPython is a multiplatform, Free Software project (BSD licensed) that offers:

- An enhanced Python shell designed for efficient interactive work. It includes many enhancements over the default Python shell, including the ability for controlling interactively all major GUI toolkits in a non-blocking manner.
- A library to build customized interactive environments using Python as the basic language (but with the possibility of having extended or alternate syntaxes).
- A system for interactive distributed and parallel computing (this is part of IPython's new development).

### License

BSD



## Upstream Contact

<http://ipython.org>

[ipython-dev@scipy.org](mailto:ipython-dev@scipy.org)

[ipython-user@scipy.org](mailto:ipython-user@scipy.org)

## Type

standard

## Version Information

package-version.txt:

```
7.29.0
```

install-requires.txt:

```
ipython >=7.13.0
```

## Equivalent System Packages

conda:

```
$ conda install ipython
```

homebrew:

```
$ brew install ipython
```

macports: install the following packages: py-ipython opensuse:

```
$ sudo zypper install python3-ipython
```

See <https://repology.org/project/ipython/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.123 ipython\_genutils: Vestigial utilities from IPython

### Description

Vestigial utilities from IPython

## Type

standard

## Version Information

package-version.txt:

```
0.2.0
```

install-requires.txt:

```
ipython_genutils >=0.2.0
```

## Equivalent System Packages

conda:

```
$ conda install ipython_genutils
```

macports: install the following packages: py-ipython\_genutils See <https://repology.org/project/python:ipython-genutils/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.124 ipywidgets: Interactive HTML widgets for Jupyter notebooks and the IPython kernel

### Description

Interactive HTML widgets for Jupyter notebooks and the IPython kernel.

## Type

standard

## Version Information

package-version.txt:

```
7.6.5
```

install-requires.txt:

```
ipywidgets >=7.5.1
```

## Equivalent System Packages

conda:

```
$ conda install ipywidgets
```

macports: install the following packages: py-ipywidgets See <https://repology.org/project/python:ipywidgets/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.125 isl: Sets and relations of integer points bounded by affine constraints

#### Description

isl is a thread-safe C library for manipulating sets and relations of integer points bounded by affine constraints. The descriptions of the sets and relations may involve both parameters and existentially quantified variables. All computations are performed in exact integer arithmetic using GMP.

#### License

isl is released under the MIT license, but depends on the LGPL GMP library.

#### Upstream Contact

- <http://groups.google.com/group/isl-development>

#### Citation

```
@incollection{Verdoolaege2010isl,
  author = {Verdoolaege, Sven},
  title = {isl: An Integer Set Library for the Polyhedral Model},
  booktitle = {Mathematical Software - ICMS 2010},
  series = {Lecture Notes in Computer Science},
  editor = {Fukuda, Komei and Hoeven, Joris and Joswig, Michael and
    Takayama, Nobuki},
  publisher = {Springer},
  isbn = {978-3-642-15581-9},
  pages = {299-302},
  volume = {6327},
  year = {2010}
}
```

## Type

optional

## Version Information

package-version.txt:

```
0.20
```

## Equivalent System Packages

conda:

```
$ conda install isl
```

cygwin:

```
$ apt-cyg install libisl-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libisl-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install isl-devel
```

freebsd:

```
$ sudo pkg install devel/isl
```

gentoo:

```
$ sudo emerge dev-libs/isl
```

homebrew:

```
$ brew install isl
```

macports: install the following packages: isl opensuse:

```
$ sudo zypper install "pkgconfig(isl)"
```

void:

```
$ sudo xbps-install isl-devel
```

See <https://repology.org/project/isl/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.126 jedi: Static analysis tool providing IDE support for Python

#### Description

Jedi is a static analysis tool for Python that is typically used in IDEs/editors plugins. Jedi has a focus on autocompletion and goto functionality. Other features include refactoring, code search and finding references.

#### Type

standard

#### Version Information

package-version.txt:

```
0.18.1
```

install-requires.txt:

```
jedi >=0.17.0
```

#### Equivalent System Packages

conda:

```
$ conda install jedi
```

macports: install the following packages: py-jedi See <https://repology.org/project/jedi/versions>, <https://repology.org/project/python:jedi/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.127 jinja2: General purpose template engine for Python

#### Description

Jinja2 is a library for Python 2.4 and onwards that is designed to be flexible, fast and secure.

If you have any exposure to other text-based template languages, such as Smarty or Django, you should feel right at home with Jinja2. It's both designer and developer friendly by sticking to Python's principles and adding functionality useful for templating environments.

## License

Modified BSD License

## Upstream Contact

Author: Pocoo Team <<http://pocoo.org>>

Homepage: <http://jinja.pocoo.org/>

## Dependencies

- Python ( $\geq 2.4$ )
- setuptools (or distribute)
- Pygments (according to ‘spkg/standard/deps’)
- docutils (dito, as a note only)

## Special Update/Build Instructions

None. (Just make sure its prerequisites are new enough in Sage, to avoid downloads during the build / installation.)

## Type

standard

## Version Information

package-version.txt:

```
2.11.2
```

install-requires.txt:

```
jinja2 >=2.11.2
```

## Equivalent System Packages

conda:

```
$ conda install jinja2
```

macports: install the following packages: py-jinja2 opensuse:

```
$ sudo zypper install python3-Jinja2
```

See <https://repology.org/project/python:jinja2/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.128 jmol: Java viewer for chemical structures in 3D

#### Description

Java viewer for chemical structures in 3D.

This provides files necessary for Jmol (java).

This package does not install JSmol (javascript), which upstream bundles with Jmol.

#### License

GPLv2+

#### Upstream Contact

- <http://jmol.sourceforge.net>
- Bob Hanson
- e-mail: [hansonr@stolaf.edu](mailto:hansonr@stolaf.edu)
- Homepage: <https://www.stolaf.edu/people/hansonr/>
- Development page: <https://github.com/BobHanson/Jmol-SwingJS>
- Download page: <https://sourceforge.net/projects/jmol/files/Jmol/>

#### Dependencies

No build-time dependencies.

The commandline jmol requires java at runtime.

#### Special Build Instructions

To avoid depending on `unzip` at build time, we have to repack the tarball, see `spkg-src`. We take the opportunity to remove some unnecessary subdirectories, see [http://wiki.jmol.org/index.php/Jmol\\_JavaScript\\_Object#In\\_detail](http://wiki.jmol.org/index.php/Jmol_JavaScript_Object#In_detail)

#### Type

standard

#### Version Information

package-version.txt:

14.29.52
----------

## Equivalent System Packages

arch:

```
$ sudo pacman -S jmol
```

conda:

```
$ conda install jmol
```

macports: install the following packages: jmol nix:

```
$ nix-env --install jmol
```

opensuse:

```
$ sudo zypper install jmol
```

void:

```
$ sudo xbps-install jmol
```

See <https://repology.org/project/jmol/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.129 jsonschema: Python implementation of JSON Schema

### Description

jsonschema is an implementation of JSON Schema for Python

### License

MIT License

### Upstream Contact

Home page: <http://github.com/Julian/jsonschema>

### Dependencies

- Python
- Setuptools
- attrs
- importlib\_metadata
- pyrsistent



**Type**

standard

**Version Information**

package-version.txt:

```
3.2.0
```

install-requires.txt:

```
jsonschema >=3.2.0
```

**Equivalent System Packages**

conda:

```
$ conda install jsonschema
```

macports: install the following packages: py-jsonschema opensuse:

```
$ sudo zypper install python3-jsonschema
```

See <https://repology.org/project/python:jsonschema/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.130 jupymake: A Python wrapper for the polymake shell****Description**

The Python module JuPyMake provides an interface to polymake.

**License**

- GPL v2

**Upstream Contact**

<https://github.com/polymake/JuPyMake>

## Dependencies

- pip
- polymake

## Special Update/Build Instructions

### Type

optional

### Version Information

package-version.txt:

```
0.9
```

install-requires.txt:

```
jupymake >=0.9
```

## Equivalent System Packages

See <https://repology.org/project/jupymake/versions>, <https://repology.org/project/python:jupymake/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.131 jupyter\_client: Jupyter protocol implementation and client libraries

### Description

jupyter\_client contains the reference implementation of the Jupyter protocol. It also provides client and kernel management APIs for working with kernels.

It also provides the jupyter kernelspec entrypoint for installing kernelspecs for use with Jupyter frontends.

### Type

standard

## Version Information

package-version.txt:

```
7.1.0
```

install-requires.txt:

```
jupyter_client >=6.1.6
```

## Equivalent System Packages

conda:

```
$ conda install jupyter_client
```

macports: install the following packages: py-jupyter\_client opensuse:

```
$ sudo zypper install python3-jupyter-client
```

See <https://repology.org/project/jupyter-client/versions>, <https://repology.org/project/python:jupyter-client/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.132 jupyter\_core: Jupyter core package

#### Description

Jupyter core package. A base package on which Jupyter projects rely.

#### Type

standard

## Version Information

package-version.txt:

```
4.9.1
```

install-requires.txt:

```
jupyter_core >=4.6.3
```

## Equivalent System Packages

conda:

```
$ conda install jupyter_core
```

macports: install the following packages: py-jupyter\_core opensuse:

```
$ sudo zypper install python3-jupyter-core
```

See <https://repology.org/project/jupyter-core/versions>, <https://repology.org/project/python:jupyter-core/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.133 jupyter\_jsmol: JSmol viewer widget for Jupyter

#### Description

JSmol viewer widget for Jupyter

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/jupyter-jsmol/>

#### Type

standard

#### Version Information

package-version.txt:

```
0.2.4
```

install-requires.txt:

```
jupyter-jsmol
```

## Equivalent System Packages

See <https://repology.org/project/jupyter-jsmol/versions>, <https://repology.org/project/python:jupyter-jsmol/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.134 jupyter\_packaging: Jupyter Packaging Utilities

#### Description

Jupyter Packaging Utilities

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/jupyter-packaging/>

#### Type

optional

#### Version Information

package-version.txt:

```
0.7.12
```

install-requires.txt:

```
jupyter-packaging
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.135 jupyterlab: An extensible environment for interactive and reproducible computing

#### Description

An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.

#### License

BSD License

#### Upstream Contact

Home page: <https://jupyter.org/>

#### Dependencies

- Python
- Setuptools
- jupyter\_core
- jupyter\_client

#### Type

optional

#### Version Information

requirements.txt:

```
jupyterlab ~= 2.2.5
```

#### Equivalent System Packages

conda:

```
$ conda install jupyterlab
```

homebrew:

```
$ brew install jupyterlab
```

macports: install the following packages: py-jupyterlab See <https://repology.org/project/jupyterlab/versions>, <https://repology.org/project/python:jupyterlab/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

#### 4.1.136 jupyterlab\_pygments: Pygments theme using JupyterLab CSS variables

##### Description

Pygments theme using JupyterLab CSS variables

##### License

BSD

##### Upstream Contact

<https://pypi.org/project/jupyterlab-pygments/>

##### Type

standard

##### Version Information

package-version.txt:

0.1.2
-------

install-requires.txt:

jupyterlab-pygments
---------------------

##### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

#### 4.1.137 jupyterlab\_widgets: A JupyterLab extension for Jupyter/IPython widgets

##### Description

A JupyterLab extension for Jupyter/IPython widgets.

## License

BSD License

## Upstream Contact

Home page: <https://github.com/jupyter-widgets/ipywidgets>

## Dependencies

- jupyterlab
- nodejs

## Type

optional

## Version Information

package-version.txt:

2.0
-----

## Equivalent System Packages

macports: install the following packages: py-jupyterlab\_widgets See <https://repology.org/project/jupyterlab-widgets/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.138 kenzo: Construct topological spaces and compute homology groups

### Description

Kenzo is a package to compute properties (mainly homology groups) of topological spaces. It allows defining spaces created from others by constructions like loop spaces, classifying spaces and so on.

### License

GPL



## Upstream Contact

- <https://github.com/gheber/kenzo>
- <https://github.com/miguelmarco/kenzo/>

## Dependencies

- ECL (Embedded Common Lisp)

## Type

optional

## Version Information

package-version.txt:

1.1.10

## Equivalent System Packages

See <https://repology.org/project/kenzo/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.139 kiwisolver: An implementation of the Cassowary constraint solving algorithm

### Description

From <https://pypi.org/project/kiwisolver/>

A fast implementation of the Cassowary constraint solver

Kiwi is an efficient C++ implementation of the Cassowary constraint solving algorithm. Kiwi is an implementation of the algorithm based on the seminal Cassowary paper. It is not a refactoring of the original C++ solver. Kiwi has been designed from the ground up to be lightweight and fast. Kiwi ranges from 10x to 500x faster than the original Cassowary solver with typical use cases gaining a 40x improvement. Memory savings are consistently > 5x.

In addition to the C++ solver, Kiwi ships with hand-rolled Python bindings.

## License

Modified BSD License

## Upstream Contact

<https://github.com/nucleic/kiwi>

## Type

standard

## Version Information

package-version.txt:

```
1.3.2
```

install-requires.txt:

```
kiwisolver >=1.0.1
```

## Equivalent System Packages

conda:

```
$ conda install kiwisolver
```

macports: install the following packages: py-kiwisolver See <https://repology.org/project/python:kiwisolver/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.140 latte\_int: Count lattice points, compute volumes, and integrate over convex polytopes

### Description

LattE (Lattice point Enumeration) Integrale solves the problems of counting lattice points in and integration over convex polytopes.

**License**

GPLv2

**Upstream Contact**

Matthias Köppe, UC Davis, CA, USA

**Type**

optional

**Version Information**

package-version.txt:

```
1.7.6
```

**Equivalent System Packages**

arch:

```
$ sudo pacman -S latte-integrale
```

conda:

```
$ conda install latte-integrale
```

opensuse:

```
$ sudo zypper install latte
```

See <https://repology.org/project/latte-integrale/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

**4.1.141 lcalc: L-function calculator****Description**

Michael Rubinstein's L-function calculator.

## License

- LGPL V2+

## Upstream contact

Michael Rubinstein <[mrubinst@uwaterloo.ca](mailto:mrubinst@uwaterloo.ca)>

Sources: [http://oto.math.uwaterloo.ca/~mrubinst/L\\_function\\_public/L.html](http://oto.math.uwaterloo.ca/~mrubinst/L_function_public/L.html)

Newer beta version 1.3 (not yet in Sage): <http://code.google.com/p/l-calc/>

## Dependencies

- GMP/MPFR
- MPFR
- PARI
- GNU patch

## Special Update/Build Instructions

- There is some garbage in the upstream sources which should be removed:

```
src/include/.Lexplicit_formula.h.swp
src/include/.Lvalue.h.swp
src/include/._DS_Store
src/include/.DS_Store
src/include/Lexplicit_formula.h.swap.crap
src/include/Lvalue.h.bak
src/src/Makefile.old
src/src/.Makefile.old.swp
src/src/._DS_Store
src/src/.DS_Store
src/src/.Lcommandline.ggo.swp
src/src/libLfunction.a
```

- We (and apparently also upstream) currently don't build Lcalc's tests (see Makefile), hence there's no spkg-check. This might change in newer upstream versions.
- The original Makefile uses \$(CC) to compile C++ (also using \$(CCFLAGS)), which it defines to 'g++', and hardcodes 'g++' when linking the shared library. (It should use \$(CXX) instead, which might \*default\* to 'g++'.) We now (lcalc-1.23.p10) patch the Makefile also to use \$(CXX) for compiling and linking C++; \$(CXX) now \*defaults\* to 'g++', and \$(CC) to 'gcc', but both can be overridden by simply setting their respective environment variables. (Same for \$(INSTALL\_DIR) btw.)

## Patches

- **Makefile.patch:**

We change a lot there, since Lcalc doesn't have a 'configure' script, and hence the Makefile is supposed to be edited to customize Lcalc (build options, locations of headers and libraries etc.). Besides that, we

- put CXXFLAGS into Lcalc's "CCFLAGS" used for compiling C++,
- remove some stuff involving LDFLAGS1 and LDFLAGS2, setting just LDFLAGS,
- use \$(MAKE) instead of 'make' in the crude build receipts,
- use CXXFLAG64 when linking the shared library,
- now use \$(CXX) for compiling and linking C++, which \*defaults\* to 'g++', but can be overridden by setting the environment variable of the same name. (\$(CC) now \*defaults\* to 'gcc', although currently not really used as far as I can see.)
- \$(INSTALL\_DIR) can now be overridden by simply setting the environment variable of the same name.

- **Lcommon.h.patch:**

Uncomment the definition of lcalc\_to\_double(const long double& x). (Necessary for GCC >= 4.6.0, cf. #10892.) Comment from there: The reason is the following code horror from src/src/include/Lcommon.h: [...] But somebody who is familiar with the codebase should really rewrite lcalc to not redefine the double() cast, that's just fragile and will sooner or later again fail inside some system headers.

- **pari-2.7.patch:**

Various changes to port to newer versions of PARI.

- **time.h.patch:**

(Patches src/include/Lcommandline\_numbertheory.h) Include also <time.h> in Lcommandline\_numbertheory.h (at least required on Cygwin, cf. #9845). This should get reported upstream.

- **lcalc-1.23\_default\_parameters\_1.patch:** Make Lcalc (1.23) build with GCC 4.9

## Type

standard

## Version Information

package-version.txt:

2.0.5
-------

## Equivalent System Packages

arch:

```
$ sudo pacman -S lcalc
```

conda:

```
$ conda install lcalc
```

Debian/Ubuntu:

```
$ sudo apt-get install lcalc liblfunction-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install L-function-devel L-function
```

freebsd:

```
$ sudo pkg install math/lcalc
```

gentoo:

```
$ sudo emerge sci-mathematics/lcalc
```

nix:

```
$ nix-env --install lcalc
```

See <https://repology.org/project/lcalc/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.142 libatomic\_ops: Access hardware-provided atomic memory update operations

#### Description

A part of the Boehm-Demers-Weiser conservative garbage collector.

#### License

- Permissive BSD + GPL 2.0+

## Upstream Contact

- Webpage: <http://www.hboehm.info/gc/>
- Email List: [bdwgc@lists.opendylan.org](mailto:bdwgc@lists.opendylan.org)

## Dependencies

None.

## Special Update/Build Instructions

None.

## Type

standard

## Version Information

package-version.txt:

```
7.6.10
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S libatomic_ops
```

conda:

```
$ conda install libatomic_ops
```

cygwin:

```
$ apt-cyg install libatomic_ops-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libatomic-ops-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libatomic_ops libatomic_ops-devel
```

freebsd:

```
$ sudo pkg install devel/libatomic_ops
```

gentoo:

```
$ sudo emerge dev-libs/libatomic_ops
```

homebrew:

```
$ brew install libatomic_ops
```

macports: install the following packages: libatomic\_ops opensuse:

```
$ sudo zypper install "pkgconfig(atomic_ops)"
```

slackware:

```
$ sudo slackpkg install libatomic_ops
```

void:

```
$ sudo xbps-install libatomic_ops-devel
```

See <https://repology.org/project/libatomic-ops/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.143 libbraiding: Computing with braids

#### Description

libbraiding is a library to compute several properties of braids, including centralizer and conjugacy check.

#### License

GPLv3+

#### SPKG Maintainers

- Miguel Marco

#### Upstream Contact

Miguel Marco ([mmarco@unizar.es](mailto:mmarco@unizar.es))

#### Type

standard



## Version Information

package-version.txt:

```
1.1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S libbraiding
```

conda:

```
$ conda install libbraiding
```

Debian/Ubuntu:

```
$ sudo apt-get install libbraiding-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libbraiding
```

freebsd:

```
$ sudo pkg install math/libbraiding
```

gentoo:

```
$ sudo emerge sci-libs/libbraiding
```

nix:

```
$ nix-env --install libbraiding
```

opensuse:

```
$ sudo zypper install libbraiding-devel
```

See <https://repology.org/project/libbraiding/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.144 libffi: A portable foreign-function interface library

### Description

Compilers for high level languages generate code that follow certain conventions. These conventions are necessary, in part, for separate compilation to work. One such convention is the “calling convention”. The “calling convention” is essentially a set of assumptions made by the compiler about where function arguments will be found on entry to a function. A “calling convention” also specifies where the return value for a function is found.

Some programs may not know at the time of compilation what arguments are to be passed to a function. For instance, an interpreter may be told at run-time about the number and types of arguments used to call a given function. Libffi can be used in such programs to provide a bridge from the interpreter program to compiled code.

The libffi library provides a portable, high level programming interface to various calling conventions. This allows a programmer to call any function specified by a call interface description at run time.

FFI stands for Foreign Function Interface. A foreign function interface is the popular name for the interface that allows code written in one language to call code written in another language. The libffi library really only provides the lowest, machine dependent layer of a fully featured foreign function interface. A layer must exist above libffi that handles type conversions for values passed between the two languages.

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## Upstream Contact

- <https://sourceware.org/libffi/>
- <https://github.com/libffi/libffi>

## Type

standard

## Version Information

package-version.txt:

3.2.1
-------

## Equivalent System Packages

conda:

```
$ conda install libffi
```

cygwin:

```
$ apt-cyg install libffi-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libffi-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libffi libffi-devel
```

freebsd:

```
$ sudo pkg install devel/libffi
```

homebrew:

```
$ brew install libffi
```

macports: install the following packages: libffi opensuse:

```
$ sudo zypper install "pkgconfig(libffi)"
```

slackware:

```
$ sudo slackpkg install libffi
```

void:

```
$ sudo xbps-install libffi-devel
```

See <https://repology.org/project/libffi/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.145 libgd: Dynamic graphics generation tool

#### Description

GD is an open source code library for the dynamic creation of images by programmers. GD is written in C, and “wrappers” are available for Perl, PHP and other languages. GD creates PNG, JPEG, GIF, WebP, XPM, BMP images, among other formats. GD is commonly used to generate charts, graphics, thumbnails, and most anything else, on the fly. While not restricted to use on the web, the most common applications of GD involve website development.

## License

- Custom (BSD-ish)

## Upstream Contact

- <https://libgd.github.io>
- Pierre Joye (<http://blog.thepimp.net>)
- <http://libgd.bitbucket.org/>

## Dependencies

- libpng
- freetype
- iconv

## Special Update/Build Instructions

See spkg-src script.

## Type

standard

## Version Information

package-version.txt:

```
2.3.2
```

## Equivalent System Packages

alpine: install the following packages: gd arch:

```
$ sudo pacman -S gd
```

conda:

```
$ conda install libgd
```

cygwin:

```
$ apt-cyg install libgd-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libgd-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install gd gd-devel
```

freebsd:

```
$ sudo pkg install graphics/gd
```

gentoo:

```
$ sudo emerge media-libs/gd
```

homebrew:

```
$ brew install gd
```

macports: install the following packages: gd2 nix:

```
$ nix-env --install gd
```

opensuse:

```
$ sudo zypper install gd "pkgconfig(gdlib)"
```

slackware:

```
$ sudo slackpkg install gd fontconfig libXpm libX11 libxcb libXau libXdmcp
```

void:

```
$ sudo xbps-install gd-devel
```

See <https://repology.org/project/gd/versions>

If the system package is installed, ./configure will check whether it can be used.

## **4.1.146 libgraphviz: Graph visualization software (callable library)**

### **Description**

Graphviz is open source graph visualization software. It has several main graph layout programs. They take descriptions of graphs in a simple text language, and make diagrams in several useful formats.

This script package represents the callable library.

### **License**

Eclipse Public License 1.0

## Upstream Contact

<https://graphviz.org/about/>

## Type

optional

## Version Information

## Equivalent System Packages

alpine: install the following packages: graphviz-dev arch:

```
$ sudo pacman -S graphviz
```

conda:

```
$ conda install graphviz
```

cygwin:

```
$ apt-cyg install graphviz
```

Debian/Ubuntu:

```
$ sudo apt-get install libgraphviz-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install graphviz
```

freebsd:

```
$ sudo pkg install graphics/graphviz
```

homebrew:

```
$ brew install graphviz
```

macports: install the following packages: graphviz nix:

```
$ nix-env --install graphviz
```

opensuse:

```
$ sudo zypper install graphviz
```

void:

```
$ sudo xbps-install graphviz
```

See <https://repology.org/project/graphviz/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.147 libhomfly: Compute the homfly polynomial of knots and links

#### Description

libhomfly is a library to compute the homfly polynomial of knots and links.

#### License

Public domain

#### SPKG Maintainers

- Miguel Marco

#### Upstream Contact

Miguel Marco ([mmarco@unizar.es](mailto:mmarco@unizar.es))

#### Dependencies

- gc

#### Type

standard

#### Version Information

package-version.txt:

```
1.02r6
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S libhomfly
```

conda:

```
$ conda install libhomfly
```

Debian/Ubuntu:

```
$ sudo apt-get install libhomfly-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libhomfly-devel
```

freebsd:

```
$ sudo pkg install math/libhomfly
```

gentoo:

```
$ sudo emerge sci-libs/libhomfly
```

nix:

```
$ nix-env --install libhomfly
```

opensuse:

```
$ sudo zypper install libhomfly-devel
```

See <https://repology.org/project/libhomfly/versions>, <https://repology.org/project/libhomfly/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.148 liblzma: General-purpose data compression software

#### Description

This packages represents liblzma, a part of XZ Utils, the free general-purpose data compression software with a high compression ratio.

#### License

Some parts public domain, other parts GNU LGPLv2.1, GNU GPLv2, or GNU GPLv3.

#### Upstream Contact

<http://tukaani.org/xz/>

#### Dependencies

#### Type

standard



## Version Information

package-version.txt:

```
5.2.5
```

## Equivalent System Packages

conda:

```
$ conda install xz
```

cygwin:

```
$ apt-cyg install xz liblzma-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install xz-utils liblzma-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install xz xz-devel
```

homebrew:

```
$ brew install xz
```

macports: install the following packages: xz opensuse:

```
$ sudo zypper install xz "pkgconfig(liblzma)"
```

slackware:

```
$ sudo slackpkg install xz
```

void:

```
$ sudo xbps-install xz liblzma-devel
```

See <https://repology.org/project/xz/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.149 libnauty: Find automorphism groups of graphs, generate non-isomorphic graphs (callable library)

### Description

Nauty has various tools for finding the automorphism group of a graph, generating non-isomorphic graphs with certain properties, etc.

This script package represents the callable library of nauty.

## License

Since version 2.6, nauty license is GPL-compatible, see  
<http://users.cecs.anu.edu.au/~bdm/nauty/COPYRIGHT.txt>  
(a copy of this file, called COPYRIGHT, is also present in the tarball)

## Special Packaging Instruction

Upstream distribute tarball named `nauty${version}.tar.gz`. We cannot deal with that so rename it `nauty-${version}.tar.gz` (notice the “-”) without any changes.

## Upstream Contact

Brendan D. McKay Computer Science Department Australian National University [bdm@cs.anu.edu.au](mailto:bdm@cs.anu.edu.au)  
Adolfo Piperno Dipartimento di Informatica Sapienza - Università di Roma [piperno@di.uniroma1.it](mailto:piperno@di.uniroma1.it)  
See <http://cs.anu.edu.au/~bdm/nauty/> or <http://pallini.di.uniroma1.it/>

## Type

optional

## Version Information

### Equivalent System Packages

Debian/Ubuntu:

```
$ sudo apt-get install libnauty-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libnauty-devel
```

homebrew:

```
$ brew install nauty
```

macports: install the following packages: nauty See <https://repology.org/project/nauty/versions>

If the system package is installed, `./configure` will check whether it can be used.

### 4.1.150 libogg: Library for the Ogg multimedia container format

#### Description

libogg is the official reference library for the Ogg multimedia container format, and the native file and stream format for the Xiph.org multimedia codecs. As with all Xiph.org technology is it an open format free for anyone to use.

Website: <http://www.xiph.org/ogg>

#### License

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#### Upstream Contact

The Xiph.org mailing lists - see <http://lists.xiph.org/mailman/listinfo>

#### Dependencies

This spkg provides dependencies for

- the Sage library

## Special Update/Build Instructions

- No changes went into src.

## Type

optional

## Version Information

package-version.txt:

```
1.3.1.p0
```

## Equivalent System Packages

conda:

```
$ conda install libogg
```

homebrew:

```
$ brew install libogg
```

macports: install the following packages: libogg opensuse:

```
$ sudo zypper install "pkgconfig(ogg)"
```

See <https://repology.org/project/libogg/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.151 libpng: Bitmap image support

### Description

libpng is the official PNG reference library. It supports almost all PNG features, is extensible, and has been extensively tested for over 13 years. The home site for development versions (i.e., may be buggy or subject to change or include experimental features) is <http://libpng.sourceforge.net/>, and the place to go for questions about the library is the png-mng-implement mailing list.

Website: <http://www.libpng.org/pub/png/libpng.html>

## License

The libpng license - see <http://www.libpng.org/pub/png/src/libpng-LICENSE.txt>

## Upstream Contact

<https://libpng.sourceforge.io>

The png mailing lists - see <http://www.libpng.org/pub/png/pngmisc.html#lists>

## Dependencies

This spkg depends on:

- libz

## Special Update/Build Instructions

- On old versions of Darwin, the symbolic links libpng.\* created by libpng16 may interfere with a system-wide libPng.dylib.

– the following is very likely to be obsolete in 2014 —

This system-wide library is likely to be a different version and on top of that, the symbols exported there are prefixed with “\_cg” (for “Core Graphics”). So even if by chance the functionalities of the two libraries were interchangeable, libraries or applications looking for one and being presented the other won’t find the symbols they expect. Note the uppercase “P” which could prevent this conflict; unfortunately, the default filesystem used by Apple is case-insensitive.

Note there would be no problem if the system-wide library was not looked for when Sage is being built or run, but that’s not the case either; it is at least looked for by the “ImageIO” framework:

- when Python is built with Mac OS extensions, fixed in #4008;
  - when Mercurial is built because it uses \$EDITOR, cf. #4678;
  - when R is built and it finds -lpng, cf. #4409 and #11696.
- this is no longer done, as of #27186 —

As not all of these problems are easily dealt with and new ones may arise, we chose to delete the \$SAGE\_LOCAL/lib/libpng.\* symlinks. Therefore, some packages like Tachyon, which by default look for -lpng are patched to look for -lpng16 instead.

## Type

standard

## Version Information

package-version.txt:

```
1.6.29.p1
```

## Equivalent System Packages

conda:

```
$ conda install libpng
```

freebsd:

```
$ sudo pkg install graphics/png
```

homebrew:

```
$ brew install libpng
```

macports: install the following packages: libpng opensuse:

```
$ sudo zypper install "pkgconfig(libpng16)"
```

slackware:

```
$ sudo slackpkg install libpng
```

void:

```
$ sudo xbps-install libpng-devel
```

See <https://repology.org/project/libpng/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.152 libsemigroups: Library for semigroups and monoids

### Description

C++ library for semigroups and monoids; used in GAP's package Semigroups.

### License

GPL-3.0

## Upstream Contact

<http://james-d-mitchell.github.io/libsemigroups> <https://github.com/james-d-mitchell/libsemigroups>

## Type

optional

## Version Information

package-version.txt:

```
1.1.0
```

## Equivalent System Packages

conda:

```
$ conda install libsemigroups
```

freebsd:

```
$ sudo pkg install math/libsemigroups
```

opensuse:

```
$ sudo zypper install "pkgconfig(libsemigroups)"
```

See <https://repology.org/project/libsemigroups/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.153 libtheora: Library for the Theora video codec

### Description

libtheora is the official reference library for the Theora video codec. Theora is a free and open video compression format from the Xiph.org Foundation.

Website: <http://www.xiph.org/theora>

### License

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### **Upstream Contact**

The Xiph.org mailing lists - see <http://lists.xiph.org/mailman/listinfo>

### **Dependencies**

This spkg depends on

- libogg
- libpng

This spkg provides dependencies for

- the Sage library

### **Special Update/Build Instructions**

- No changes went into src.

### **Type**

experimental

### **Version Information**

package-version.txt:

1.1.1
-------



## Equivalent System Packages

conda:

```
$ conda install libtheora
```

homebrew:

```
$ brew install theora
```

macports: install the following packages: libtheora opensuse:

```
$ sudo zypper install "pkgconfig(theora)"
```

See <https://repology.org/project/libtheora/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.154 libxml2: XML parser and toolkit

#### Description

XML C parser and toolkit

#### License

MIT

#### Upstream Contact

<http://www.xmlsoft.org/index.html>

#### Type

optional

#### Version Information

## Equivalent System Packages

alpine: install the following packages: libxml2-dev arch:

```
$ sudo pacman -S libxml2
```

cygwin:

```
$ apt-cyg install libxml2-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libxml2-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libxml2-devel
```

freebsd:

```
$ sudo pkg install libxml2
```

gentoo:

```
$ sudo emerge dev-libs/libxml2
```

homebrew:

```
$ brew install libxml2
```

macports: install the following packages: py-libxml2 nix:

```
$ nix-env --install libxml2
```

opensuse:

```
$ sudo zypper install libxml2
```

slackware:

```
$ sudo slackpkg install libxml2
```

void:

```
$ sudo xbps-install libxml2-devel
```

See <https://repology.org/project/libxml2/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.155 lidia: A library for computational number theory

#### Description

A library for computational number theory.

Abandoned upstream and has disappeared from the web at TU Darmstadt.

We use as our new upstream a version minimally maintained for the LattE project.

<https://www.math.ucdavis.edu/~latte/software/packages/lidia/current/lidia-2.3.0+latte-patches-2014-10-04.tar.gz>

## License

lidia is released under the GPL, or so it is claimed. See [https://groups.google.com/forum/#!msg/sage-devel/kTxgPSqrbUM/5Txj3\\_IKhlQJ](https://groups.google.com/forum/#!msg/sage-devel/kTxgPSqrbUM/5Txj3_IKhlQJ) and <https://lists.debian.org/debian-legal/2007/07/msg00120.html>

## Upstream Contact

Matthias Köppe, UC Davis, CA, USA

## Dependencies

GMP.

## Type

optional

## Version Information

package-version.txt:

```
2.3.0+latte-patches-2019-05-02
```

## Equivalent System Packages

See <https://repology.org/project/lidia/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.156 lie: Library for the representation theory of complex semisimple Lie groups and algebras

### Description

LiE is the name of a software package that enables mathematicians and physicists to perform computations of a Lie group theoretic nature. It focuses on the representation theory of complex semisimple (reductive) Lie groups and algebras, and on the structure of their Weyl groups and root systems.

LiE does not compute directly with elements of the Lie groups and algebras themselves; it rather computes with weights, roots, characters and similar objects. Some specialities of LiE are: tensor product decompositions, branching to subgroups, Weyl group orbits, reduced elements in Weyl groups, distinguished coset representatives and much more. These operations have been compiled into the program which results in fast execution: typically one or two orders of magnitude faster than similar programs written in a general purpose program.

The LiE programming language makes it possible to customise and extend the package with more mathematical functions. A user manual is provided containing many examples.

LiE establishes an interactive environment from which commands can be given that involve basic programming primitives and powerful built-in functions. These commands are read by an interpreter built into the package and passed

to the core of the system. This core consists of programs representing some 100 mathematical functions. The interpreter offers on-line facilities which explain operations and functions, and which give background information about Lie group theoretical concepts and about currently valid definitions and values.

(from <http://www-math.univ-poitiers.fr/~maavl/LiE/description.html> )

### License

GNU Lesser General Public License (LGPL), version unspecified

### Upstream Contact

- Marc van Leeuwen, <http://www-math.univ-poitiers.fr/~maavl/>

### Dependencies

- readline
- ncurses
- bison (not included in this package or in Sage!)

### Type

experimental

### Version Information

package-version.txt:

```
2.2.2
```

### Equivalent System Packages

Debian/Ubuntu:

```
$ sudo apt-get install lie
```

gentoo:

```
$ sudo emerge sci-mathematics/lie
```

macports: install the following packages: LiE nix:

```
$ nix-env --install lie
```

opensuse:

```
$ sudo zypper install LiE
```

See <https://repology.org/project/lie/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.157 linbox: Linear algebra with dense, sparse, structured matrices over the integers and finite fields

#### Description

LinBox is a C++ template library for exact, high-performance linear algebra computation with dense, sparse, and structured matrices over the integers and over finite fields.

#### License

LGPL V2 or later

#### Upstream Contact

- <https://linalg.org/>
- <linbox-devel@googlegroups.com>
- <linbox-use@googlegroups.com>

#### SPKG Repository

<https://bitbucket.org/malb/linbox-spkg>

#### Dependencies

- GNU patch
- GMP/MPFR
- MPFR
- NTL
- fpLLL
- IML
- M4RI
- M4RIE
- Givaro
- FFLAS/FFPACK
- a BLAS implementation such as openblas

## Special Update/Build Instructions

TODO:

- spkg-check is disabled for now, should work in the next release after 1.3.2.
- Check whether `make fullcheck` works/builds, is worth running, and doesn't take ages. (Version 1.1.6 doesn't seem to have such a target.)

## Type

standard

## Version Information

package-version.txt:

```
1.6.3.p1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S linbox
```

conda:

```
$ conda install linbox
```

Debian/Ubuntu:

```
$ sudo apt-get install liblinbox-dev
```

freebsd:

```
$ sudo pkg install math/linbox
```

nix:

```
$ nix-env --install linbox
```

opensuse:

```
$ sudo zypper install "pkgconfig(linbox)"
```

See <https://repology.org/project/linbox/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.158 llvm: The LLVM Compiler Infrastructure, including the Clang C/C++/Objective-C compiler

#### Description

The LLVM Project is a collection of modular and reusable compiler and toolchain technologies.

Clang is an “LLVM native” C/C++/Objective-C compiler.

The libc++ and libc++ ABI projects provide a standard conformant and high-performance implementation of the C++ Standard Library, including full support for C++11 and C++14.

#### License

Apache 2.0 License with LLVM exceptions

#### Upstream Contact

<https://llvm.org/>

#### Type

optional

#### Version Information

#### Equivalent System Packages

alpine: install the following packages: clang arch:

```
$ sudo pacman -S clang
```

cygwin:

```
$ apt-cyg install clang
```

Debian/Ubuntu:

```
$ sudo apt-get install clang
```

Fedora/Redhat/CentOS:

```
$ sudo yum install clang
```

freebsd:

```
$ sudo pkg install devel/llvm
```

gentoo:

```
$ sudo emerge sys-devel/clang
```

homebrew:

```
$ brew install llvm
```

macports: install the following packages: clang nix:

```
$ nix-env --install clang
```

openbsd: install the following packages: devel/llvm opensuse:

```
$ sudo zypper install llvm
```

slackware:

```
$ sudo slackpkg install llvm
```

void:

```
$ sudo xbps-install clang
```

If the system package is installed, ./configure will check whether it can be used.

## 4.1.159 Ircalc: Littlewood-Richardson calculator

### Description

Littlewood-Richardson Calculator

<http://sites.math.rutgers.edu/~asbuch/Ircalc/>

### License

GNU General Public License V2+

### Upstream Contact

Anders S. Buch ([asbuch@math.rutgers.edu](mailto:asbuch@math.rutgers.edu))

<https://bitbucket.org/asbuch/Ircalc>

### Type

standard

### Version Information

package-version.txt:

```
1.2.p1
```



## Equivalent System Packages

arch:

```
$ sudo pacman -S lrcalc
```

conda:

```
$ conda install lrcalc
```

Debian/Ubuntu:

```
$ sudo apt-get install liblrcalc-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install lrcalc-devel
```

freebsd:

```
$ sudo pkg install math/lrcalc
```

gentoo:

```
$ sudo emerge sci-mathematics/lrcalc
```

nix:

```
$ nix-env --install lrcalc
```

See <https://repology.org/project/lrcalc/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.160 Irslib: Reverse search algorithm for vertex enumeration and convex hull problems

#### Description

Irslib implements the linear reverse search algorithm of Avis and Fukuda.

See the homepage (<http://cgm.cs.mcgill.ca/~avis/C/lrs.html>) for details.

We use an autotoolized version from <https://github.com/mkoeppel/irslib/tree/autoconfiscation>

#### License

Irslib is released under a GPL v2+ license.

## Upstream Contact

David Avis, avis at cs dot mcgill dot edu.

## Dependencies

To build and install the “plrs” binary, a multi-thread version of lrs, need to first install the full Boost package (“sage -i boost”).

If the package finds an MPI C++ compiler script (mpic++), it also builds and installs the “mplrs” binary, a distributed version of lrs using MPI.

(Sage currently does not make use of plrs and mplrs.)

## Special Update/Build Instructions

### Type

optional

### Version Information

package-version.txt:

```
071b+autotools-2021-07-13
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S lrs
```

conda:

```
$ conda install lrslib
```

Debian/Ubuntu:

```
$ sudo apt-get install lrslib
```

Fedora/Redhat/CentOS:

```
$ sudo yum install lrslib
```

freebsd:

```
$ sudo pkg install math/lrslib
```

gentoo:

```
$ sudo emerge sci-libs/lrslib
```

nix:

```
$ nix-env --install lrs
```

opensuse:

```
$ sudo zypper install lrslib lrslib-devel
```

See <https://repology.org/project/lrslib/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.161 m4ri: fast arithmetic with dense matrices over GF(2)

#### Description

M4RI: Library for matrix multiplication, reduction and inversion over GF(2). (See also m4ri/README for a brief overview.)

#### License

- GNU General Public License Version 2 or later (see src/COPYING)

#### Upstream Contact

- Authors: Martin Albrecht et al.
- Email: <m4ri-devel@googlegroups.com>
- Website: <https://bitbucket.org/malb/m4ri>

#### Dependencies

- libPNG

#### Special Update/Build Instructions

- Delete the upstream Mercurial repositories (file m4ri/.hgtags, directory m4ri/.hg).
- Delete the directory m4ri/autom4te.cache (if present).
- Delete m4ri.vcproj (and perhaps other unnecessary baggage).
- Touch m4ri/configure to make sure it is newer than its sources.

## Type

standard

## Version Information

package-version.txt:

```
20200115
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S m4ri
```

conda:

```
$ conda install m4ri
```

Debian/Ubuntu: Fedora/Redhat/CentOS:

```
$ sudo yum install m4ri-devel
```

freebsd:

```
$ sudo pkg install math/m4ri
```

gentoo:

```
$ sudo emerge sci-libs/m4ri[png]
```

nix:

```
$ nix-env --install m4ri
```

opensuse:

```
$ sudo zypper install "pkgconfig(m4ri)"
```

See <https://repology.org/project/libm4ri/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.162 m4rie: Arithmetic with dense matrices over $\text{GF}(2^k)$

### Description

M4RIE: Library for matrix multiplication, reduction and inversion over  $\text{GF}(2^k)$  for  $2 \leq k \leq 10$ .

## License

- GNU General Public License Version 2 or later (see src/COPYING)

## Upstream Contact

- Authors: Martin Albrecht
- Email: <m4ri-devel@googlegroups.com>
- Website: <http://m4ri.sagemath.org>

## Dependencies

- M4RI
- Givaro

## Type

standard

## Version Information

package-version.txt:

```
20200115
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S m4rie
```

conda:

```
$ conda install m4rie
```

Debian/Ubuntu:

```
$ sudo apt-get install libm4rie-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install m4rie-devel
```

freebsd:

```
$ sudo pkg install math/m4rie
```

gentoo:

```
$ sudo emerge sci-libs/m4rie
```

nix:

```
$ nix-env --install m4rie
```

opensuse:

```
$ sudo zypper install "pkgconfig(m4rie)"
```

See <https://repology.org/project/libm4rie/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.163 markupsafe: Safely add untrusted strings to HTML/XML markup

#### Description

Implements a XML/HTML/XHTML Markup safe string for Python

#### License

Simplified BSD

#### Upstream Contact

Home page: <http://github.com/mitsuhiko/markupsafe>

#### Dependencies

Python, setuptools

#### Type

standard

#### Version Information

package-version.txt:

```
1.1.1
```

install-requires.txt:

```
markupsafe >=1.1.0
```

## Equivalent System Packages

conda:

```
$ conda install markupsafe
```

macports: install the following packages: py-markupsafe opensuse:

```
$ sudo zypper install python3-MarkupSafe
```

See <https://repology.org/project/python:markupsafe/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.164 Mathics3: A general-purpose computer algebra system.

#### Description

A general-purpose computer algebra system.

#### License

GPL

#### Upstream Contact

<https://pypi.org/project/Mathics3/>

#### Type

optional

#### Version Information

package-version.txt:

```
4.0.0
```

install-requires.txt:

```
Mathics3
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.165 **mathics\_scanner**: Character Tables and Tokenizer for Mathics and the Wolfram Language.

#### Description

Character Tables and Tokenizer for Mathics and the Wolfram Language.

#### License

GPL-3.0-only

#### Upstream Contact

<https://pypi.org/project/Mathics-Scanner/>

#### Type

optional

#### Version Information

package-version.txt:

1.2.4
-------

install-requires.txt:

Mathics-Scanner
-----------------

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>



### 4.1.166 mathjax: A JavaScript library for displaying mathematical formulas

#### Description

MathJax is a JavaScript library for displaying mathematical formulas.

MathJax is used by the Jupyter notebook and the Sphinx documentation.

#### License

Apache License, version 2.0

#### Upstream Contact

Home page: <https://www.mathjax.org/>

#### Dependencies

None.

#### Special Update/Build Instructions

None.

#### Patches

- `nopng_config.patch`: prevent font warning messages since png files are removed. See section “Trimming II – not strictly necessary” of <https://github.com/mathjax/MathJax-docs/wiki/Guide%3A-reducing-size-of-a-mathjax-installation>

#### Type

standard

#### Version Information

package-version.txt:

2.7.4.p0
----------

## Equivalent System Packages

conda:

```
$ conda install mathjax
```

opensuse:

```
$ sudo zypper install mathjax
```

void:

```
$ sudo xbps-install mathjax
```

See <https://repology.org/project/mathjax/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.167 matplotlib: Python 2D plotting library

### Description

From the Matplotlib website: matplotlib is a python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms. matplotlib can be used in python scripts, the python and ipython shell (ala matlab or mathematica), web application servers, and six graphical user interface toolkits.

### License

The Matplotlib license - see <http://matplotlib.sourceforge.net/users/license.html>: Matplotlib only uses BSD compatible code, and its license is based on the PSF license. See the Open Source Initiative licenses page for details on individual licenses. Non-BSD compatible licenses (eg LGPL) are acceptable in matplotlib Toolkits. For a discussion of the motivations behind the licencing choice, see Licenses.

### Upstream Contact

<https://matplotlib.org>

The matplotlib mailing lists: see <http://sourceforge.net/projects/matplotlib>

### Dependencies

- python
- numpy
- setuptools ( $\geq 0.7$ )
- freetype
- patch (used in `spkg-install`)
- dateutil

- pyparsing
- tornado
- kiwisolver

### Build Instructions/Changes

- NOTE: To drastically cut down on spkg size, we delete the internal testing images. To do this, we repackage the tarball by removing the contents of `lib/matplotlib/tests/baseline_images/*`, this is done by the `spkg-src` script.
- `setup.py.patch`: disable loading of Tests. Otherwise, `setup.py` raises an error because it can't find the deleted files from `src/lib/matplotlib/tests/baseline_images/*`
- NOTE: as of matplotlib-1.0.0 and Sage 4.6, Sage does not use `$HOME/.matplotlib` by default. Instead, it sets `MPLCONFIGDIR` to a subdirectory in `$DOT_SAGE`, see `src/bin/sage-env`

### Type

standard

### Version Information

package-version.txt:

```
3.5.1
```

install-requires.txt:

```
matplotlib >=3.3.1
```

### Equivalent System Packages

conda:

```
$ conda install matplotlib
```

macports: install the following packages: `py-matplotlib` `opensuse`:

```
$ sudo zypper install python3-matplotlib
```

See <https://repology.org/project/python:matplotlib/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.168 matplotlib\_inline: Inline Matplotlib backend for Jupyter

#### Description

Inline Matplotlib backend for Jupyter

#### License

BSD 3-Clause

#### Upstream Contact

<https://pypi.org/project/matplotlib-inline/>

#### Type

standard

#### Version Information

package-version.txt:

0.1.2
-------

install-requires.txt:

matplotlib-inline
-------------------

#### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.169 maxima: System for manipulating symbolic and numerical expressions

#### Description

Maxima is a system for the manipulation of symbolic and numerical expressions, including differentiation, integration, Taylor series, Laplace transforms, ordinary differential equations, systems of linear equations, polynomials, and sets, lists, vectors, matrices, and tensors. Maxima yields high precision numeric results by using exact fractions, arbitrary precision integers, and variable precision floating point numbers. Maxima can plot functions and data in two and three dimensions.

For more information, see the Maxima web site

<http://maxima.sourceforge.net>

## License

Maxima is distributed under the GNU General Public License, with some export restrictions from the U.S. Department of Energy. See the file COPYING.

## Upstream Contact

- The Maxima mailing list - see <http://maxima.sourceforge.net/maximalist.html>

## Dependencies

- ECL (Embedded Common Lisp)

## Special Update/Build Instructions

1. Go to <http://sourceforge.net/projects/maxima/files/Maxima-source/> and download the source tarball maxima-x.y.z.tar.gz; place it in the upstream/ directory.
2. Update package-version.txt and run 'sage -package fix-checksum'.
3. Make sure the patches still apply cleanly, and update them if necessary.
4. Test the resulting package.

All patch files in the patches/ directory are applied. Descriptions of these patches are either in the patch files themselves or below.

- 0001-taylor2-Avoid-blowing-the-stack-when-diff-expand-isn.patch: Fix for Maxima bug #2520 (abs\_integrate fails on abs(sin(x)) and abs(cos(x))). Introduced in Trac #13364 (Upgrade Maxima to 5.29.1).
- build-fasl.patch: Build a fasl library for ecl in addition to an executable program. Introduced in Trac #16178 (Build maxima fasl without asdf).
- infodir.patch: Correct the path to the Info directory. Introduced in Trac #11348 (maxima test fails when install tree is moved).
- matrixexp.patch: Fix matrixexp(matrix([%i\*%pi])), which broke after Maxima 5.29.1. Introduced in Trac #13973.
- maxima.system.patch: Set c::\*compile-in-constants\* to t. Introduced in Trac #11966 (OS X 10.7 Lion: Maxima fails to build).
- undoing\_true\_false\_printing\_patch.patch: Revert an upstream change causing '?' to be printed around some words. Introduced in Trac #13364 (Upgrade Maxima to 5.29.1).

## Type

standard

## Version Information

package-version.txt:

```
5.45.0.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S maxima-ecl
```

conda:

```
$ conda install maxima
```

Debian/Ubuntu:

```
$ sudo apt-get install maxima-sage maxima
```

homebrew:

```
$ brew install maxima
```

macports: install the following packages: maxima nix:

```
$ nix-env --install maxima-ecl
```

opensuse:

```
$ sudo zypper install maxima-exec-clisp
```

void:

```
$ sudo xbps-install maxima
```

See <https://repology.org/project/maxima/versions>, <https://repology.org/project/maxima-ecl/versions>, <https://repology.org/project/maxima-sage/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.170 mcqd: An exact algorithm for finding a maximum clique in an undirected graph

### Description

MaxCliqueDyn is a fast exact algorithm for finding a maximum clique in an undirected graph.

## License

GPL 3

## Upstream Contact

MCQD is currently being maintained by Janez Konc. <https://gitlab.com/janezkonc/mcqd>

## Dependencies

None

## Type

optional

## Version Information

package-version.txt:

```
1.0.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S mcqd
```

opensuse:

```
$ sudo zypper install mcqd
```

See <https://repology.org/project/mcqd/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.171 meataxe: Library for computing with modular representations

### Description

SharedMeatAxe 1.0 is an autotoolized shared library version of C MeatAxe 2.4.24, a set of programs for computing with modular representations. The package comprises a shared library “libmtx”, as well as several executables.

See <http://users.minet.uni-jena.de/~king/SharedMeatAxe/> for the package documentation.

## Licence

The Shared Meat-Axe is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 2 of the License, or (at your option) any later version. See the file COPYING.

## Upstream contact

- Simon King <[simon.king@uni-jena.de](mailto:simon.king@uni-jena.de)>

## Type

optional

## Version Information

package-version.txt:

```
1.0.1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S shared_meataxe
```

Fedora/Redhat/CentOS:

```
$ sudo yum install sharedmeataxe
```

See <https://repology.org/project/shared-meataxe/versions>, <https://repology.org/project/sharedmeataxe/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.172 MemoryAllocator: An extension class to allocate memory easily with cython.

This extension class started as part of the Sage software.

## Description

development website: [https://github.com/sagemath/memory\\_allocator](https://github.com/sagemath/memory_allocator)

PyPI page: [https://pypi.org/project/memory\\_allocator](https://pypi.org/project/memory_allocator)



## License

GPL-3.0

## Upstream Contact

[https://github.com/sagemath/memory\\_allocator](https://github.com/sagemath/memory_allocator)

## Dependencies

- Cython

## Type

standard

## Version Information

package-version.txt:

```
0.1.1
```

install-requires.txt:

```
memory_allocator
```

## Equivalent System Packages

conda:

```
$ conda install memory-allocator
```

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.173 mistune: A markdown parser in pure Python

### Description

The fastest markdown parser in pure Python

## License

BSD License

## Upstream Contact

Home Page: <https://github.com/lepture/mistune>

## Dependencies

Python, Cython, Pip

## Type

standard

## Version Information

package-version.txt:

```
0.8.4
```

install-requires.txt:

```
mistune >=0.8.4
```

## Equivalent System Packages

conda:

```
$ conda install mistune
```

See <https://repology.org/project/mistune/versions>, <https://repology.org/project/python:mistune/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.174 modular\_decomposition: A modular decomposition algorithm

### Description

This is an implementation of a modular decomposition algorithm.

<http://www.liafa.jussieu.fr/~fm/> (in french)

**License**

GPL

**Upstream Contact**

Fabien de Montgolfier

<http://www.liafa.jussieu.fr/~fm/>

**Dependencies**

None

**Patches**

None

**Type**

experimental

**Version Information**

package-version.txt:

20100607
----------

**Equivalent System Packages**

See <https://repology.org/project/modular-decomposition/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### **4.1.175 mpc: Arithmetic of complex numbers with arbitrarily high precision and correct rounding**

**Description**

From <http://www.multiprecision.org/mpc>: GNU MPC is a C library for the arithmetic of complex numbers with arbitrarily high precision and correct rounding of the result. It extends the principles of the IEEE-754 standard for fixed precision real floating point numbers to complex numbers, providing well-defined semantics for every operation. At the same time, speed of operation at high precision is a major design goal.

## License

LGPLv3+ for the code and GFDLv1.3+ (with no invariant sections) for the documentation.

## Upstream Contact

The MPC website is located at <http://www.multiprecision.org/mpc> .

The MPC team can be contacted via the MPC mailing list:

[mpc-discuss@lists.gforge.inria.fr](mailto:mpc-discuss@lists.gforge.inria.fr)

## Dependencies

- MPIR
- MPFR

## Special Update/Build Instructions

- `mpc_mul_faster.patch`: Patch from Paul Zimmermann to speed up MPC multiplication (for small precisions) by reducing overhead in MPFR operations.

## Type

standard

## Version Information

package-version.txt:

```
1.1.0
```

## Equivalent System Packages

conda:

```
$ conda install mpc
```

cygwin:

```
$ apt-cyg install libmpc-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libmpc-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install libmpc libmpc-devel
```

freebsd:

```
$ sudo pkg install math/mpc
```

gentoo:

```
$ sudo emerge dev-libs/mpc
```

homebrew:

```
$ brew install libmpc
```

nix:

```
$ nix-env --install libmpc
```

opensuse:

```
$ sudo zypper install mpc-devel
```

void:

```
$ sudo xbps-install libmpc-devel
```

See <https://repology.org/project/libmpc/versions>

If the system package is installed, ./configure will check whether it can be used.

#### 4.1.176 mpfi: Multiple precision interval arithmetic library based on MPFR

##### Description

MPFI is a library for interval arithmetic, which is built upon the MPFR multiple precision floating-point arithmetic.

MPFI is intended to be a portable library written in C for arbitrary precision interval arithmetic with intervals represented using MPFR reliable floating-point numbers. It is based on the GNU MP library and on the MPFR library. The purpose of an arbitrary precision interval arithmetic is on the one hand to get “guaranteed” results, thanks to interval computation, and on the other hand to obtain accurate results, thanks to multiple precision arithmetic. The MPFI library is built upon MPFR in order to benefit from the correct rounding provided, for each operation or function, by MPFR. Further advantages of using MPFR are its portability and compliance with the IEEE 754 standard for floating-point arithmetic.

##### License

This version of MPFI is released under the GNU Lesser General Public License. It is permitted to link MPFI to non-free programs, as long as when distributing them the MPFI source code and a means to re-link with a modified MPFI is provided.

## Upstream Contact

<http://perso.ens-lyon.fr/nathalie.revol/software.html>

The MPFI website is located at <http://mpfi.gforge.inria.fr/>

The MPFI team can be contacted via the MPFI mailing list: [mpfi-users@lists.gforge.inria.fr](mailto:mpfi-users@lists.gforge.inria.fr)

## Dependencies

- GMP
- MPFR

## Type

standard

## Version Information

package-version.txt:

```
1.5.2
```

## Equivalent System Packages

conda:

```
$ conda install mpfi
```

Debian/Ubuntu:

```
$ sudo apt-get install libmpfi-dev
```

freebsd:

```
$ sudo pkg install math/mpfi
```

gentoo:

```
$ sudo emerge sci-libs/mpfi
```

homebrew:

```
$ brew install mpfi
```

nix:

```
$ nix-env --install mpfi
```

opensuse:

```
$ sudo zypper install mpfi-devel
```

See <https://repology.org/project/mpfi/versions>

If the system package is installed, `./configure` will check whether it can be used.

### 4.1.177 mpfr: Multiple-precision floating-point computations with correct rounding

#### Description

The MPFR library is a C library for multiple-precision floating-point computations with correct rounding. MPFR has continuously been supported by the INRIA and the current main authors come from the Caramba and AriC project-teams at Loria (Nancy, France) and LIP (Lyon, France) respectively; see more on the credit page. MPFR is based on the GMP multiple-precision library.

The main goal of MPFR is to provide a library for multiple-precision floating-point computation which is both efficient and has a well-defined semantics. It copies the good ideas from the ANSI/IEEE-754 standard for double-precision floating-point arithmetic (53-bit significand).

#### License

MPFR is free. It is distributed under the GNU Lesser General Public License (GNU Lesser GPL), version 3 or later (2.1 or later for MPFR versions until 2.4.x). The library has been registered in France by the Agence de Protection des Programmes under the number IDDN FR 001 120020 00 R P 2000 000 10800, on 15 March 2000. This license guarantees your freedom to share and change MPFR, to make sure MPFR is free for all its users. Unlike the ordinary General Public License, the Lesser GPL enables developers of non-free programs to use MPFR in their programs. If you have written a new function for MPFR or improved an existing one, please share your work!

#### Upstream Contact

The MPFR website is located at <http://mpfr.org/>

The MPFR team can be contacted via the MPFR mailing list: [mpfr@loria.fr](mailto:mpfr@loria.fr)

#### Dependencies

- GMP/MPIR
- GNU patch

#### Special Update/Build Instructions

- Make sure MPFR's settings of `CC` and `CFLAGS` still get properly extracted, currently from its `config.log` in the `src/` directory.
- We should remove the `configure` option `--disable-thread-safe` in case the issues without that have meanwhile been fixed. (Then we should actually pass `--enable-thread-safe`.)

## TODO

- `--disable-thread-safe` should be switched to `--enable-thread-safe`, need to check that this works on the buildbot machines

## Type

standard

## Version Information

package-version.txt:

```
4.0.1.p0
```

## Equivalent System Packages

conda:

```
$ conda install mpfr
```

cygwin:

```
$ apt-cyg install libmpfr-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libmpfr-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install mpfr-devel
```

freebsd:

```
$ sudo pkg install math/mpfr
```

gentoo:

```
$ sudo emerge dev-libs/mpfr
```

homebrew:

```
$ brew install mpfr
```

opensuse:

```
$ sudo zypper install "pkgconfig(mpfr)"
```

slackware:

```
$ sudo slackpkg install mpfr
```



void:

```
$ sudo xbps-install mpfr-devel
```

See <https://repology.org/project/mpfr/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.178 mpfrcx: Arithmetic of univariate polynomials over arbitrary precision real or complex numbers

#### Description

Mpfrcx is a library for the arithmetic of univariate polynomials over arbitrary precision real (Mpfr) or complex (Mpc) numbers, without control on the rounding. For the time being, only the few functions needed to implement the floating point approach to complex multiplication are implemented. On the other hand, these comprise asymptotically fast multiplication routines such as Toom–Cook and the FFT.

#### License

MPFRCX is distributed under the Gnu Lesser General Public License, either version 2.1 of the licence, or (at your option) any later version (LGPLv2.1+).

#### Upstream Contact

The MPFRCX website is located at <http://www.multiprecision.org/mpfrcx>.

#### Type

optional

#### Version Information

package-version.txt:

```
0.5
```

#### Equivalent System Packages

opensuse:

```
$ sudo zypper install mpfrcx-devel
```

See <https://repology.org/project/mpfrcx/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.179 mpmath: Pure Python library for multiprecision floating-point arithmetic

#### Description

Mpmath is a pure-Python library for multiprecision floating-point arithmetic. It provides an extensive set of transcendental functions, unlimited exponent sizes, complex numbers, interval arithmetic, numerical integration and differentiation, root-finding, linear algebra, and much more. Almost any calculation can be performed just as well at 10-digit or 1000-digit precision, and in many cases mpmath implements asymptotically fast algorithms that scale well for extremely high precision work. If available, mpmath will (optionally) use gmpy to speed up high precision operations.

#### Upstream Contact

- Author: Fredrik Johansson
- Email: [fredrik.johansson@gmail.com](mailto:fredrik.johansson@gmail.com)
- <http://mpmath.org>
- Website: <https://github.com/fredrik-johansson/mpmath/>

#### Dependencies

- Python

#### Type

standard

#### Version Information

package-version.txt:

```
1.2.1
```

install-requires.txt:

```
mpmath >=1.1.0
```

#### Equivalent System Packages

conda:

```
$ conda install mpmath
```

See <https://repology.org/project/mpmath/versions>, <https://repology.org/project/python:mpmath/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.180 nauty: Find automorphism groups of graphs, generate non-isomorphic graphs

#### Description

Nauty has various tools for finding the automorphism group of a graph, generating non-isomorphic graphs with certain properties, etc.

#### License

Since version 2.6, nauty license is GPL-compatible, see

<http://users.cecs.anu.edu.au/~bdm/nauty/COPYRIGHT.txt>

(a copy of this file, called COPYRIGHT, is also present in the tarball)

#### Special Packaging Instruction

Upstream distribute tarball named `nauty${version}.tar.gz`. We cannot deal with that so rename it `nauty-${version}.tar.gz` (notice the “-”) without any changes.

#### Upstream Contact

Brendan D. McKay, Computer Science Department Australian National University [bdm@cs.anu.edu.au](mailto:bdm@cs.anu.edu.au)

Adolfo Piperno, Dipartimento di Informatica Sapienza - Università di Roma [piperno@di.uniroma1.it](mailto:piperno@di.uniroma1.it)

See <http://cs.anu.edu.au/~bdm/nauty/> Or <http://pallini.di.uniroma1.it/>

#### Type

standard

#### Version Information

package-version.txt:

```
27r1.p1
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S nauty
```

conda:

```
$ conda install nauty
```

Debian/Ubuntu:

```
$ sudo apt-get install nauty
```

Fedora/Redhat/CentOS:

```
$ sudo yum install nauty
```

freebsd:

```
$ sudo pkg install math/nauty
```

homebrew:

```
$ brew install nauty
```

nix:

```
$ nix-env --install nauty
```

opensuse:

```
$ sudo zypper install nauty nauty-devel
```

See <https://repology.org/project/nauty/versions>

If the system package is installed, ./configure will check whether it can be used.

#### **4.1.181 nbclient: A client library for executing notebooks. Formerly nbconvert's ExecutePreprocessor.**

##### **Description**

A client library for executing notebooks. Formerly nbconvert's ExecutePreprocessor.

##### **License**

BSD

##### **Upstream Contact**

<https://pypi.org/project/nbclient/>

##### **Type**

standard

## Version Information

package-version.txt:

```
0.5.9
```

install-requires.txt:

```
nbclient
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.182 nbconvert: Converting Jupyter Notebooks

#### Description

jupyter nbconvert converts notebooks to various other formats via Jinja templates.

#### Type

standard

#### Version Information

package-version.txt:

```
6.1.0
```

install-requires.txt:

```
nbconvert >=5.6.1
```

## Equivalent System Packages

conda:

```
$ conda install nbconvert
```

opensuse:

```
$ sudo zypper install jupyter-nbconvert
```

See <https://repology.org/project/nbconvert/versions>, <https://repology.org/project/python:nbconvert/versions>, <https://repology.org/project/jupyter-nbconvert/versions>, <https://repology.org/project/python:jupyter-nbconvert/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.183 nbformat: Base implementation of the Jupyter notebook format

#### Description

This package contains the base implementation of the Jupyter Notebook format, and Python APIs for working with notebooks.

#### Type

standard

#### Version Information

package-version.txt:

```
5.1.3
```

install-requires.txt:

```
nbformat >=5.0.7
```

#### Equivalent System Packages

conda:

```
$ conda install nbformat
```

opensuse:

```
$ sudo zypper install jupyter-nbformat
```

See <https://repology.org/project/nbformat/versions>, <https://repology.org/project/python:nbformat/versions>, <https://repology.org/project/jupyter-nbformat/versions>, <https://repology.org/project/python:jupyter-nbformat/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.184 ncurses: Classic terminal output library

#### Description

Ncurses (new curses, pronounced “enn-curses”) started as a freely distributable “clone” of System V Release 4.0 (SVr4) curses. It has outgrown the “clone” description, and now contains many features which are not in SVr4 curses. Curses is a pun on the term “cursor optimization”. It is a library of functions that manage an application’s display on character-cell terminals (e.g., VT100).

The name “ncurses” was first used as the name of the curses library in Pavel Curtis’s pcurses, dated 1982. It was apparently developed on a BSD 4.4 system, at Cornell. Parts of pcurses are readily identifiable in ncurses, including the basics for the terminfo compiler (named compile in that package):

- the Caps, used to define the terminfo capabilities
- awk scripts MKcatab.awk, MKnames.awk

- the library modules used for the terminfo compiler.

Besides ncurses, parts of pcurses still survive in 2010, in recognizable form in Solaris.

Website: <http://invisible-island.net/ncurses>

### License

- MIT-style

### Upstream Contact

- [bug-ncurses@gnu.org](mailto:bug-ncurses@gnu.org)

### Dependencies

None

### Special Update/Build Instructions

None

### Type

standard

### Version Information

package-version.txt:

```
6.0.p0
```

### Equivalent System Packages

conda:

```
$ conda install ncurses
```

cygwin:

```
$ apt-cyg install libncurses-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libncurses5-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install ncurses-devel
```

freebsd:

```
$ sudo pkg install devel/ncurses
```

homebrew:

```
$ brew install ncurses
```

macports: install the following packages: ncurses opensuse:

```
$ sudo zypper install "pkgconfig(ncurses)" "pkgconfig(ncursesw)"
```

slackware:

```
$ sudo slackpkg install ncurses
```

void:

```
$ sudo xbps-install ncurses-devel
```

See <https://repology.org/project/ncurses/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.185 nest\_asyncio: Patch asyncio to allow nested event loops

#### Description

Patch asyncio to allow nested event loops

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/nest-asyncio/>

#### Type

standard

#### Version Information

package-version.txt:

```
1.5.1
```

install-requires.txt:

```
nest-asyncio
```



## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.186 networkx: Python package for complex networks

#### Description

NetworkX (NX) is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.

#### License

BSD

#### Upstream Contact

<https://networkx.github.io/>

#### Type

standard

#### Version Information

package-version.txt:

```
2.6.3
```

install-requires.txt:

```
# gentoo uses 2.5
networkx >=2.4, <2.7
```

## Equivalent System Packages

conda:

```
$ conda install networkx
```

macports: install the following packages: py-networkx opensuse:

```
$ sudo zypper install python3-networkx
```

See <https://repology.org/project/python:networkx/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.187 nibabel: Access a multitude of neuroimaging data formats

#### Description

Access a multitude of neuroimaging data formats

#### License

MIT License

#### Upstream Contact

<https://pypi.org/project/nibabel/>

#### Type

optional

#### Version Information

requirements.txt:

```
nibabel
```

#### Equivalent System Packages

conda:

```
$ conda install nibabel
```

macports: install the following packages: py-nibabel opensuse:

```
$ sudo zypper install python3-nibabel
```

See <https://repology.org/project/nibabel/versions>, <https://repology.org/project/python:nibabel/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.188 ninja\_build: A build system with a focus on speed

#### Description

Ninja is a small build system with a focus on speed.

## License

Apache License 2.0

## Upstream Contact

<https://ninja-build.org/>

## Dependencies

None

## Type

optional

## Version Information

package-version.txt:

```
1.8.2
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S ninja
```

conda:

```
$ conda install ninja
```

cygwin:

```
$ apt-cyg install ninja
```

Debian/Ubuntu:

```
$ sudo apt-get install ninja-build
```

Fedora/Redhat/CentOS:

```
$ sudo yum install ninja-build
```

freebsd:

```
$ sudo pkg install devel/ninja
```

gentoo:

```
$ sudo emerge dev-util/ninja
```

homebrew:

```
$ brew install ninja
```

macports: install the following packages: ninja opensuse:

```
$ sudo zypper install ninja
```

void:

```
$ sudo xbps-install  ninja
```

See <https://repology.org/project/ninja/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.189 nodeenv: A tool to create isolated node.js environments

### Description

nodeenv (node.js virtual environment) is a tool to create isolated node.js environments.

It creates an environment that has its own installation directories, that doesn't share libraries with other node.js virtual environments.

### License

BSD License

### Upstream Contact

Home page: <https://github.com/ekalinin/nodeenv>

### Dependencies

- Python

### Type

optional

## Version Information

requirements.txt:

```
nodeenv ~= 1.4.0
```

## Equivalent System Packages

conda:

```
$ conda install nodeenv
```

homebrew:

```
$ brew install nodeenv
```

See <https://repology.org/project/nodeenv/versions>, <https://repology.org/project/python:nodeenv/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.190 nodejs: A JavaScript runtime built on Chrome's V8 JavaScript engine

### Description

Node.js® is a JavaScript runtime built on Chrome's V8 JavaScript engine.

It is installed into an isolated nodeenv.

### License

MIT License

### Upstream Contact

Home page: <https://nodejs.org/>

### Dependencies

- nodeenv

### Type

optional

## Version Information

package-version.txt:

```
12.18.3
```

## Equivalent System Packages

conda:

```
$ conda install nodejs
```

homebrew:

```
$ brew install node
```

opensuse:

```
$ sudo zypper install nodejs
```

See <https://repology.org/project/nodejs/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.191 normaliz: Computations in affine monoids, vector configurations, lattice polytopes, and rational cones

### Description

Normaliz is a tool for computations in affine monoids, vector configurations, lattice polytopes, and rational cones.

For more details see <http://www.mathematik.uni-osnabrueck.de/normaliz/>

### License

- GPL v3

### Upstream Contact

- [normaliz@uos.de](mailto:normaliz@uos.de)
- Winfried Bruns <[wbruns@uos.de](mailto:wbruns@uos.de)>
- Christof Söger <[csoeger@uos.de](mailto:csoeger@uos.de)>
- see also <https://www.normaliz.uni-osnabrueck.de/home/contact/>  
and <https://github.com/Normaliz>

## Dependencies

- GMP/MPIR
- boost

## Special Update/Build Instructions

- The spkg currently disables features that require packages SCIP and CoCoA, for which we don't have packages (yet).

## Type

optional

## Version Information

package-version.txt:

```
3.8.10
```

## Equivalent System Packages

conda:

```
$ conda install normaliz
```

opensuse:

```
$ sudo zypper install normaliz-devel
```

See <https://repology.org/project/normaliz/versions>, <https://repology.org/project/libnormaliz/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.192 notebook: Jupyter notebook, a web-based notebook environment for interactive computing

### Description

The Jupyter HTML notebook is a web-based notebook environment for interactive computing.

## Type

standard

## Version Information

package-version.txt:

```
6.4.6
```

install-requires.txt:

```
notebook >=6.1.1
```

## Equivalent System Packages

conda:

```
$ conda install notebook
```

macports: install the following packages: py-notebook See <https://repology.org/project/python:notebook/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.193 notedown: Create IPython notebooks from markdown

### Description

Notedown is a simple tool to create IPython notebooks from markdown.

### License

BSD 2-Clause License

### Upstream Contact

Author: Aaron O’Leary Home page: <https://github.com/aaren/notedown>

### Dependencies

- Python
- setuptools
- nbformat
- nbconvert
- six
- pandoc\_attributes



**Type**

optional

**Version Information**

package-version.txt:

```
1.5.1
```

install-requires.txt:

```
notedown >=1.5.1
```

**Equivalent System Packages**

conda:

```
$ conda install notedown
```

See <https://repology.org/project/python:notedown/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.194 ntl: A library for doing number theory****Description**

NTL is a high-performance, portable C++ library providing data structures and algorithms for manipulating signed, arbitrary length integers, and for vectors, matrices, and polynomials over the integers and over finite fields.

Website: <http://www.shoup.net/ntl/>

**License**

- GNU LGPLv2.1+

**Upstream Contact**

- Victor Shoup - for contact info see <http://www.shoup.net/>

## Dependencies

- gmp
- gf2x

## Special Update/Build Instructions

- None

## Type

standard

## Version Information

package-version.txt:

```
11.4.3
```

## Equivalent System Packages

conda:

```
$ conda install ntl
```

cygwin:

```
$ apt-cyg install libntl-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libntl-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install ntl-devel
```

freebsd:

```
$ sudo pkg install math/ntl
```

gentoo:

```
$ sudo emerge dev-libs/ntl
```

homebrew:

```
$ brew install ntl
```

macports: install the following packages: ntl nix:

```
$ nix-env --install ntl
```

opensuse:

```
$ sudo zypper install ntl-devel
```

void:

```
$ sudo xbps-install ntl-devel
```

See <https://repology.org/project/ntl/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.195 numpy: Package for scientific computing with Python

#### Description

This package adds numerical linear algebra and other numerical computing capabilities to python.

#### Upstream Contact

- <https://numpy.org/>
- Travis Oliphant
- Fernando Perez
- Brian Granger

#### Dependencies

- GNU patch
- Python
- Lapack
- Blas
- Atlas
- Fortran

#### Special Update/Build Instructions

- Scipy uses numpy's distutils to control its compilation of fortran code.  
Whenever numpy is updated it is necessary to make sure that scipy still builds ok.

## Type

standard

## Version Information

package-version.txt:

```
1.21.4
```

install-requires.txt:

```
numpy >=1.19
```

## Equivalent System Packages

conda:

```
$ conda install numpy
```

homebrew:

```
$ brew install numpy
```

macports: install the following packages: py-numpy See <https://repology.org/project/python:numpy/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.196 openblas: An optimized implementation of BLAS (Basic Linear Algebra Subprograms)

### Description

OpenBLAS is an optimized open library implementing the Basic Linear Algebra Subprograms (BLAS) specification. It is based on GotoBLAS2 1.13 BSD version.

### License

3-clause BSD license

## SPKG Repository

<https://www.openblas.net>

GitHub page: <https://github.com/xianyi/OpenBLAS>

Releases: <https://github.com/xianyi/OpenBLAS/releases>

## Upstream Contact

- OpenBLAS users mailing list:  
<https://groups.google.com/forum/#!forum/openblas-users>
- OpenBLAS developers mailing list:  
<https://groups.google.com/forum/#!forum/openblas-dev>

## Type

standard

## Version Information

package-version.txt:

```
0.3.18
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S openblas lapack cblas
```

conda:

```
$ conda install openblas blas=2.*=openblas
```

cygwin:

```
$ apt-cyg install liblapack-devel libopenblas
```

Debian/Ubuntu:

```
$ sudo apt-get install libopenblas-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install openblas-devel
```

freebsd:

```
$ sudo pkg install math/openblas
```

gentoo:

```
$ sudo emerge sci-libs/openblas
```

homebrew:

```
$ brew install openblas
```

macports: install the following packages: OpenBLAS-devel nix:

```
$ nix-env --install blas lapack
```

opensuse:

```
$ sudo zypper install openblas-devel
```

void:

```
$ sudo xbps-install openblas-devel
```

See <https://repology.org/project/openblas/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.197 openssl: Implementation of the SSL and TLS protocols

### Description

From wikipedia: OpenSSL is an open source implementation of the SSL and TLS protocols. The core library (written in the C programming language) implements the basic cryptographic functions and provides various utility functions. Wrappers allowing the use of the OpenSSL library in a variety of computer languages are available.

### License

- Apache License v2 (considered compatible with GPL v3)

### Upstream Contact

- <http://openssl.org/>

### Type

standard

## Version Information

package-version.txt:

```
3.0.1
```

## Equivalent System Packages

alpine: install the following packages: openssl-dev arch:

```
$ sudo pacman -S openssl
```

conda:

```
$ conda install openssl
```

cygwin:

```
$ apt-cyg install libssl-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install openssl libssl-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install openssl openssl-devel
```

freebsd:

```
$ sudo pkg install security/openssl
```

homebrew:

```
$ brew install openssl
```

macports: install the following packages: openssl nix:

```
$ nix-env --install openssl
```

opensuse:

```
$ sudo zypper install "pkgconfig(libssl)"
```

slackware:

```
$ sudo slackpkg install openssl openssl-solibs
```

void:

```
$ sudo xbps-install openssl-devel
```

See <https://repology.org/project/openssl/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.198 ore\_algebra: Ore algebra

#### Description

A Sage implementation of Ore algebras, Ore polynomials, and differentially finite functions.

Main features for the most common algebras include basic arithmetic and actions; gcd and lcm; D-finite closure properties; creative telescoping; natural transformations between related algebras; guessing; desingularization; solvers for polynomials, rational functions and (generalized) power series. Univariate differential operators also support the numerical computation of analytic solutions with rigorous error bounds and related features.

#### License

- GPL-2.0+

#### Upstream Contact

- Website: [https://github.com/mkauers/ore\\_algebra/](https://github.com/mkauers/ore_algebra/)
- Sage accounts: mkauers, mmezzarobba

#### Dependencies

- None

#### Type

optional

#### Version Information

requirements.txt:

```
git+https://github.com/mkauers/ore_algebra@cfc386f2cc1d3e044c71dfb149444355b16d775
↪#egg=ore_algebra
```

#### Equivalent System Packages

See <https://repology.org/project/ore-algebra/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>



### 4.1.199 p\_group\_cohomology: Modular cohomology rings of finite groups

#### Description

Modular Cohomology Rings of Finite Groups

The package is located at <http://users.fmi.uni-jena.de/cohomology/>, that's to say the tarball `p_group_cohomology-x.y.tar.xz` can be found there and the documentation of the package is provided at <http://users.fmi.uni-jena.de/cohomology/documentation/>

#### License

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David J. Green <[david.green@uni-jena.de](mailto:david.green@uni-jena.de)>

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The full text of the GPL is available at:

<http://www.gnu.org/licenses/>

The package includes a data base of cohomology rings of the groups of order 64 and provides access to a data base of cohomology rings of the groups of order 128 and 243, located at

<http://cohomology.uni-jena.de/db/>

These data bases are distributed under the Creative Commons Attribution-Share Alike 3.0 License. The full text of this licence is available at

<http://creativecommons.org/licenses/by-sa/3.0/>

#### SPKG Maintainers

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We thank William Stein for giving us access to various computers on which we could build test the SPKG and on which some huge computations could be completed, and acknowledge the support by National Science Foundation Grant No. DMS-0821725.

We thank Mathieu Dutour Sikirić for hints on how to use GAP more efficiently.

We owe Peter Symonds the idea of using the Poincaré series in a rather efficient completeness criterion.

We are grateful to John Palmieri for his help on making `p_group_cohomology` work with `python-3`.

## Dependencies

- The `SharedMeatAxe` needs to be installed, as a build time dependency.

This can be met by installing the `meataxe` spkg

## Testing

Our package provides a very short test suite for David Green’s routines for the computation of minimal projective resolutions. The majority of this package’s tests is formed by doc tests in the Cython code. In fact, any class, method and function is covered by tests.

Note that internet access is required for these tests, as it is attempted to download cohomology rings from a public data base in the web.

The script `spkg-check` calls `sage -t --force_lib` on the files in `pGroupCohomology`.

## Documentation

The documentation of this package is automatically built, if the environment variable `SAGE_SPKG_INSTALL_DOCS` is yes (do “`export SAGE_SPKG_INSTALL_DOCS=yes`” on the command line before installation). The documents are put into `SAGE_ROOT/local/share/doc/p_group_cohomology/`.

## Type

optional

## Version Information

`package-version.txt`:

`3.3.2`

`install-requires.txt`:

`p_group_cohomology >=3.3`

## Equivalent System Packages

See <https://repology.org/project/sagemath-p-group-cohomology/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.200 packaging: Core utilities for Python packages

#### Description

Core utilities for Python packages

#### Type

standard

#### Version Information

package-version.txt:

```
21.0
```

install-requires.txt:

```
packaging >=18.0
# Trac #30975: packaging 20.5 is known to work but we have to silence
↪ "DeprecationWarning: Creating a LegacyVersion"
```

## Equivalent System Packages

conda:

```
$ conda install packaging
```

macports: install the following packages: py-packaging See <https://repology.org/project/packaging/versions>, <https://repology.org/project/python:packaging/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.201 palettable: Color palettes for Python

#### Description

Color palettes for Python

## License

## Upstream Contact

<https://pypi.org/project/palettable/>

## Type

optional

## Version Information

package-version.txt:

3.3.0
-------

install-requires.txt:

palettable
------------

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.202 palp: A package for Analyzing Lattice Polytopes

### Description

A Package for Analyzing Lattice Polytopes (PALP) is a set of C programs for calculations with lattice polytopes and applications to toric geometry.

It contains routines for vertex and facet enumeration, computation of incidences and symmetries, as well as completion of the set of lattice points in the convex hull of a given set of points. In addition, there are procedures specialised to reflexive polytopes such as the enumeration of reflexive subpolytopes, and applications to toric geometry and string theory, like the computation of Hodge data and fibration structures for toric Calabi-Yau varieties. The package is well tested and optimised in speed as it was used for time consuming tasks such as the classification of reflexive polyhedra in 4 dimensions and the creation and manipulation of very large lists of 5-dimensional polyhedra.

While originally intended for low-dimensional applications, the algorithms work in any dimension and our key routine for vertex and facet enumeration compares well with existing packages.

## License

- When released, GPL 2 was in force.
- There is a link to a web page, which now points to GPL 3, but would have pointed to GPL 2 at the time the package was released.
- Therefore one can deduce the authors were happy for this to be released under GPL 2 or a later version.

## Upstream Contact

- Author: Harald Skarke ([skarke@maths.ox.ac.uk](mailto:skarke@maths.ox.ac.uk))
- Home page: <http://hep.itp.tuwien.ac.at/~kreuzer/CY/CYpalp.html>

## Type

standard

## Version Information

package-version.txt:

```
2.11
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S palp
```

conda:

```
$ conda install palp
```

Debian/Ubuntu:

```
$ sudo apt-get install palp
```

Fedora/Redhat/CentOS:

```
$ sudo yum install palp
```

nix:

```
$ nix-env --install palp
```

See <https://repology.org/project/palp/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.203 pandoc: A document converter

#### Description

This script package represents the document converter pandoc.

We do not have an SPKG for it. The purpose of this script package is to associate system package lists with it.

#### Type

optional

#### Version Information

#### Equivalent System Packages

alpine: install the following packages: pandoc arch:

```
$ sudo pacman -S pandoc
```

conda:

```
$ conda install pandoc
```

Debian/Ubuntu:

```
$ sudo apt-get install pandoc
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pandoc
```

freebsd:

```
$ sudo pkg install textproc/hs-pandoc
```

gentoo:

```
$ sudo emerge app-text/pandoc
```

homebrew:

```
$ brew install pandoc
```

macports: install the following packages: pandoc opensuse:

```
$ sudo zypper install pandoc
```

void:

```
$ sudo xbps-install pandoc
```

See <https://repology.org/project/pandoc/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.204 pandoc\_attributes: A parser and generator for pandoc block attributes

#### Description

This is a simple parser / emitter for pandoc block attributes, intended for use with pandocfilters.

#### License

BSD 2-Clause License

#### Upstream Contact

- Author: Aaron O’Leary
- Home page: <https://github.com/aaren/pandoc-attributes>

#### Dependencies

- Python
- setuptools
- pandocfilters

#### Special Update/Build Instructions

There are no release numbers, hence find the latest commit, download [https://github.com/aaren/pandoc-attributes/archive/\\${COMMIT}.zip](https://github.com/aaren/pandoc-attributes/archive/${COMMIT}.zip) and rename it pandoc\_attributes-\${COMMIT:0:8}.zip

#### Type

optional

#### Version Information

package-version.txt:

```
8bc82f6d
```

install-requires.txt:

```
pandoc_attributes >=8bc82f6d
```

## Equivalent System Packages

conda:

```
$ conda install pandoc-attributes
```

See <https://repology.org/project/pandoc-attributes/versions>, <https://repology.org/project/python:pandoc-attributes/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.205 pandocfilters: A Python module for writing pandoc filters

#### Description

A python module for writing pandoc filters.

#### License

BSD 3-Clause License

#### Upstream Contact

Author: John MacFarlane Home page: <https://github.com/jgm/pandocfilters>

#### Dependencies

- Python

#### Special Update/Build Instructions

Download the last release from <https://pypi.python.org/pypi/pandocfilters>

#### Type

standard

#### Version Information

package-version.txt:

```
1.4.3
```

install-requires.txt:

```
pandocfilters >=1.4.2
```



## Equivalent System Packages

conda:

```
$ conda install pandocfilters
```

macports: install the following packages: py-pandocfilters See <https://repology.org/project/python:pandocfilters/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.206 pari: Computer algebra system for fast computations in number theory

#### Description

PARI/GP is a widely used computer algebra system designed for fast computations in number theory (factorizations, algebraic number theory, elliptic curves...), but also contains a large number of other useful functions to compute with mathematical entities such as matrices, polynomials, power series, algebraic numbers etc., and a lot of transcendental functions. PARI is also available as a C library to allow for faster computations.

Originally developed by Henri Cohen and his co-workers (Université Bordeaux I, France), PARI is now under the GPL and maintained by Karim Belabas with the help of many volunteer contributors.

#### License

GPL version 2+

#### Upstream Contact

- <http://pari.math.u-bordeaux.fr/>

#### Dependencies

- Perl
- MPIR or GMP
- Readline
- GNU patch (shipped with Sage)

#### Special Update/Build Instructions

See patches/README.txt for a list of patches.

The current upstream tarball was created from the PARI git repository by running “make snapshot”.

## Type

standard

## Version Information

package-version.txt:

```
2.13.3
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S pari pari-galdata pari-seadata pari-elldata pari-galpol
```

conda:

```
$ conda install pari pari-elldata pari-galdata pari-galpol pari-seadata
```

Debian/Ubuntu:

```
$ sudo apt-get install pari-gp2c libpari-dev pari-doc pari-elldata pari-galdata pari-  
↪galpol pari-seadata
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pari-devel pari-gp --setopt=tsflags= pari-galdata pari-galpol pari-  
↪seadata pari-elldata
```

freebsd:

```
$ sudo pkg install math/pari
```

gentoo:

```
$ sudo emerge sci-mathematics/pari sci-mathematics/pari-data
```

homebrew:

```
$ brew install pari pari-elldata pari-galdata pari-galpol pari-seadata
```

macports: install the following packages: pari nix:

```
$ nix-env --install pari
```

opensuse:

```
$ sudo zypper install pari-devel pari-gp
```

void:

```
$ sudo xbps-install pari pari-devel pari-elldata pari-galdata pari-galpol pari-seadata
```

See <https://repology.org/project/pari/versions>, <https://repology.org/project/pari-gp/versions>, <https://repology.org/project/pari-data/versions>, <https://repology.org/project/pari-elldata/versions>, <https://repology.org/project/pari-galdata/versions>, <https://repology.org/project/pari-galpol/versions>, <https://repology.org/project/pari-nftables/versions>, <https://repology.org/project/pari-seadata/versions>, <https://repology.org/project/pari-seadata-big/versions>

If the system package is installed, `./configure` will check whether it can be used.

### 4.1.207 `pari_elldata`: PARI data package for elliptic curves

#### Description

PARI/GP version of J. E. Cremona Elliptic Curve Data, needed by `ellsearch` and `ellidentify`.

#### License

GNU General Public License (GPL version 2 or any later version).

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

#### Dependencies

- Installation: None
- Runtime: PARI/GP

#### Type

optional

#### Version Information

package-version.txt:

```
20161017
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S pari-elldata
```

conda:

```
$ conda install pari-elldata
```

freebsd:

```
$ sudo pkg install math/pari-elldata
```

opensuse:

```
$ sudo zypper install pari-elldata
```

void:

```
$ sudo xbps-install pari-elldata
```

See <https://repology.org/project/pari-elldata/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.208 pari\_galdata: PARI data package needed to compute Galois groups in degrees 8 through 11

#### Description

PARI package “galdata”: Needed by polgalois to compute Galois group in degrees 8 through 11.

#### License

GPL version 2+

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

#### Dependencies

None (package contains data files only)

#### Type

standard

#### Version Information

package-version.txt:

```
20080411.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S pari-galdata
```

conda:

```
$ conda install pari-galdata
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pari-galdata
```

freebsd:

```
$ sudo pkg install pari_galdata
```

opensuse:

```
$ sudo zypper install pari-galdata
```

void:

```
$ sudo xbps-install pari-galdata
```

See <https://repology.org/project/pari-galdata/versions>

If the system package is installed, `./configure` will check whether it can be used.

### 4.1.209 **pari\_galpol: PARI data package for polynomials defining Galois extensions of the rationals**

#### Description

PARI package of the GALPOL database of polynomials defining Galois extensions of the rationals, accessed by `galoisgetpol`, `galoisgetgroup`, `galoisgetname`.

#### License

GNU General Public License (GPL version 2 or any later version).

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

## Dependencies

- Installation: None
- Runtime: PARI/GP

## Type

optional

## Version Information

package-version.txt:

```
20180625
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S pari-galpol
```

conda:

```
$ conda install pari-galpol
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pari-galpol
```

freebsd:

```
$ sudo pkg install math/pari_galpol
```

opensuse:

```
$ sudo zypper install pari-galpol
```

void:

```
$ sudo xbps-install pari-galpol
```

See <https://repology.org/project/pari-galpol/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.210 pari\_nftables: PARI data package for number fields

#### Description

Repackaging of the historical megrez number field tables (errors fixed, 1/10th the size, easier to use).

#### License

GNU General Public License (GPL version 2 or any later version).

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

#### Dependencies

- Installation: None
- Runtime: PARI/GP

#### Type

optional

#### Version Information

package-version.txt:

```
20080929
```

#### Equivalent System Packages

conda:

```
$ conda install pari-nftables
```

freebsd:

```
$ sudo pkg install math/pari_nftables
```

opensuse:

```
$ sudo zypper install pari-nftables
```

See <https://repology.org/project/pari-nftables/versions>

If the system package is installed, ./configure will check whether it can be used.

#### 4.1.211 pari\_seadata: PARI data package needed by ellap for large primes (full version)

##### Description

Needed by ellap for large primes. These polynomials were extracted from the ECHIDNA databases and computed by David R. Kohel. This covers finite fields of cardinality  $q$  up to 750 bits. PARI/GP 2.9 contains fallback code to go on when all modular polynomials in the database have been exhausted and can handle larger fields (with an important slowdown).

##### License

GNU General Public License (GPL version 2 or any later version).

##### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

##### Dependencies

- Installation: None
- Runtime: PARI/GP

##### Type

optional

##### Version Information

package-version.txt:

```
20090618
```

##### Equivalent System Packages

arch:

```
$ sudo pacman -S pari-seadata
```

conda:

```
$ conda install pari-seadata
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pari-seadata
```

freebsd:



```
$ sudo pkg install math/pari-seadata
```

opensuse:

```
$ sudo zypper install pari-seadata
```

void:

```
$ sudo xbps-install pari-seadata
```

See <https://repology.org/project/pari-seadata/versions>, <https://repology.org/project/pari-seadata-big/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.212 pari\_seadata\_small: PARI data package needed by ellap for large primes (small version)

#### Description

PARI package “seadata\_small”: Needed by ellap for large primes. This “small” one is a much smaller version that should be suitable for primes up to 350 bits. These polynomials were extracted from the ECHIDNA databases and computed by David R. Kohel.

#### License

GPL version 2+

#### Upstream Contact

<http://pari.math.u-bordeaux.fr/>

#### Dependencies

None (package contains data files only)

#### Type

standard

#### Version Information

package-version.txt:

```
20090618.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S pari-seadata
```

conda:

```
$ conda install pari-seadata-small
```

freebsd:

```
$ sudo pkg install math/pari_seadata
```

See <https://repology.org/project/pari-seadata-small/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.213 parso: A Python parser

#### Description

Parso is a Python parser that supports error recovery and round-trip parsing for different Python versions (in multiple Python versions). Parso is also able to list multiple syntax errors in your python file.

#### Type

standard

#### Version Information

package-version.txt:

```
0.8.2
```

install-requires.txt:

```
parso >=0.7.0
```

## Equivalent System Packages

conda:

```
$ conda install parso
```

macports: install the following packages: py-parso See <https://repology.org/project/python:parso/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.214 patch: Applies diffs and patches to files

#### Description

‘patch’ takes a patch file containing a difference listing produced by the ‘diff’ program and applies those differences to one or more original files, producing patched versions.

The version of ‘patch’ included is the GNU one. Some of the ‘diff’ files produced by GNU ‘diff’ are not acceptable to some versions of the ‘patch’ command, such as the ‘patch’ command that comes with Solaris.

#### License

This program is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2, or (at your option) any later version.

#### Upstream Contact

Main web site: <http://savannah.gnu.org/projects/patch/>

Bug database: <http://savannah.gnu.org/bugs/?group=patch>

Submit bugs: <http://savannah.gnu.org/bugs/?func=additem&group=patch>

Mailing lists: [bug-patch@gnu.org](mailto:bug-patch@gnu.org)

#### Dependencies

None

#### Special Update/Build Instructions

In the event patches ever need to be made to this package, the method of applying the patches should not rely on the ‘patch’ existing on the system.

#### Type

standard

#### Version Information

package-version.txt:

2.7.5
-------

## Equivalent System Packages

arch:

```
$ sudo pacman -S patch
```

conda:

```
$ conda install patch
```

cygwin:

```
$ apt-cyg install patch
```

Debian/Ubuntu:

```
$ sudo apt-get install patch
```

Fedora/Redhat/CentOS:

```
$ sudo yum install patch
```

freebsd:

```
$ sudo pkg install devel/patch
```

homebrew:

```
$ brew install gpatch
```

macports: install the following packages: gpatch opensuse:

```
$ sudo zypper install patch
```

slackware:

```
$ sudo slackpkg install patch
```

void:

```
$ sudo xbps-install patch
```

See <https://repology.org/project/patch/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.215 pcre: Perl-compatible regular expressions library

### Description

Perl-compatible regular expressions library.

## License

BSD License; see LICENCE (sic) at the root of the original tarball.

## Upstream Contact

Mailing list at <https://lists.exim.org/mailman/listinfo/pcre-dev>

## Dependencies

None listed.

## Special Update/Build Instructions

None applicable (see README at tarball's root).

## Type

standard

## Version Information

package-version.txt:

```
8.40.p2
```

## Equivalent System Packages

conda:

```
$ conda install pcre
```

cygwin:

```
$ apt-cyg install libpcre-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libpcre3-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pcre pcre-devel
```

freebsd:

```
$ sudo pkg install devel/pcre
```

homebrew:

```
$ brew install pcre
```

macports: install the following packages: pcre opensuse:

```
$ sudo zypper install "pkgconfig(libpcre)" "pkgconfig(libpcreposix)"  
↪ "pkgconfig(libpcrecpp)"
```

slackware:

```
$ sudo slackpkg install pcre
```

void:

```
$ sudo xbps-install pcre-devel
```

See <https://repology.org/project/pcre/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.216 pdf2svg - PDF to SVG convertor

### Description

pdf2svg is a tiny command-line utility using Cairo and Poppler to convert PDF documents into SVG files. Multi-page PDF can be split up to one SVG per page by passing a file naming specification.

### License

GPL

### Upstream Contact

<http://cityinthesky.co.uk/opensource/pdf2svg/>

### Type

optional

### Version Information

### Equivalent System Packages

alpine: install the following packages: pdf2svg arch:

```
$ sudo pacman -S pdf2svg
```

conda:

```
$ conda install pdf2svg
```

Debian/Ubuntu:

```
$ sudo apt-get install pdf2svg
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pdf2svg
```

freebsd:

```
$ sudo pkg install graphics/pdf2svg
```

homebrew:

```
$ brew install pdf2svg
```

macports: install the following packages: pdf2svg nix:

```
$ nix-env --install pdf2svg
```

opensuse:

```
$ sudo zypper install pdf2svg
```

void:

```
$ sudo xbps-install pdf2svg
```

See <https://repology.org/project/pdf2svg/versions>

If the system package is installed, ./configure will check whether it can be used.

#### 4.1.217 **perl\_cpan\_polymake\_prereq**: Represents all Perl packages that are prerequisites for polymake

##### Description

This script package represents all Perl packages that are prerequisites for polymake.

##### License

Various free software licenses

##### Type

optional

## Version Information

### Equivalent System Packages

cpan:

```
$ cpan -i XML::Writer XML::LibXML XML::LibXSLT File::Slurp JSON SVG Term::ReadKey
```

Debian/Ubuntu:

```
$ sudo apt-get install libxml-libxslt-perl libxml-writer-perl libxml2-dev libperl-dev \
↳ libfile-slurp-perl libjson-perl libsvg-perl libterm-readkey-perl libterm-readline-gnu-
↳ perl
```

Fedora/Redhat/CentOS:

```
$ sudo yum install perl-ExtUtils-Embed perl-File-Slurp perl-JSON perl-Term-ReadLine-Gnu \
↳ perl-TermReadKey perl-XML-Writer perl-XML-LibXML perl-XML-LibXSLT
```

freebsd:

```
$ sudo pkg install textproc/p5-XML-Writer textproc/p5-XML-LibXML textproc/p5-XML-LibXSLT \
↳ devel/p5-File-Slurp converters/p5-JSON textproc/p5-SVG devel/p5-Term-ReadKey
```

gentoo:

```
$ sudo emerge XML-Writer XML-LibXML XML-LibXSLT File-Slurp dev-perl/Term-ReadLine-Gnu \
↳ dev-perl/TermReadKey JSON SVG
```

If the system package is installed, ./configure will check whether it can be used.

## 4.1.218 perl\_mongodb: A prerequisite for polymake's PolyDB feature

### Description

This script package represents the Perl package MongoDB, which is needed for the PolyDB feature of polymake.

### License

Various free software licenses

### Type

optional



## Version Information

### Equivalent System Packages

cpan:

```
$ cpan -i MongoDB
```

Debian/Ubuntu:

```
$ sudo apt-get install libmongodb-perl
```

Fedora/Redhat/CentOS:

```
$ sudo yum install perl-MongoDB
```

freebsd:

```
$ sudo pkg install databases/p5-MongoDB
```

gentoo:

```
$ sudo emerge dev-perl/MongoDB
```

If the system package is installed, ./configure will check whether it can be used.

### 4.1.219 `perl_term_readline_gnu`: Perl extension for the GNU Readline/History libraries

#### Description

Perl extension for the GNU Readline/History Library

Available on CPAN

#### License

The Perl 5 License (Artistic 1 & GPL 1)

#### Upstream Contact

Hiroo HAYASHI

## Dependencies

readline

## Type

optional

## Version Information

package-version.txt:

```
1.35
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S perl-term-readline-gnu
```

cpan:

```
$ cpan -i Term::ReadLine::Gnu
```

cygwin:

```
$ apt-cyg install perl-Term-ReadLine-Gnu
```

Debian/Ubuntu:

```
$ sudo apt-get install libterm-readline-gnu-perl
```

Fedora/Redhat/CentOS:

```
$ sudo yum install perl-Term-ReadLine-Gnu
```

freebsd:

```
$ sudo pkg install devel/p5-Term-ReadLine-Gnu
```

gentoo:

```
$ sudo emerge dev-perl/Term-ReadLine-Gnu
```

macports: install the following packages: p5-term-readline-gnu opensuse:

```
$ sudo zypper install "perl(Term::ReadLine::Gnu)"
```

void:

```
$ sudo xbps-install perl-Term-ReadLine-Gnu
```

See <https://repology.org/project/perl:term-readline-gnu/versions>, <https://repology.org/project/perl:termreadline-gnu/versions>

If the system package is installed, `./configure` will check whether it can be used.

## 4.1.220 pexpect: Python module for controlling and automating other programs

### Description

Pexpect is a pure Python module for spawning child applications; controlling them; and responding to expected patterns in their output.

### License

ISC license: <http://opensource.org/licenses/isc-license.txt> This license is approved by the OSI and FSF as GPL-compatible.

### Upstream Contact

- <http://pexpect.readthedocs.org/en/stable/>
- <https://github.com/pexpect/pexpect>

### Dependencies

- GNU patch
- Python

### Type

standard

### Version Information

package-version.txt:

4.8.0
-------

install-requires.txt:

pexpect >=4.8.0
-----------------

## Equivalent System Packages

conda:

```
$ conda install pexpect
```

macports: install the following packages: py-pexpect opensuse:

```
$ sudo zypper install python3-pexpect
```

See <https://repology.org/project/pexpect/versions>, <https://repology.org/project/python:pexpect/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.221 pickleshare: A ‘shelve’ like datastore with concurrency support

#### Description

PickleShare - a small ‘shelve’ like datastore with concurrency support

Like shelve, a PickleShareDB object acts like a normal dictionary. Unlike shelve, many processes can access the database simultaneously. Changing a value in database is immediately visible to other processes accessing the same database.

Concurrency is possible because the values are stored in separate files. Hence the “database” is a directory where all files are governed by PickleShare.

#### Type

standard

#### Version Information

package-version.txt:

```
0.7.5
```

install-requires.txt:

```
pickleshare >=0.7.5
```

## Equivalent System Packages

conda:

```
$ conda install pickleshare
```

macports: install the following packages: py-pickleshare opensuse:

```
$ sudo zypper install python3-pickleshare
```

See <https://repology.org/project/pickleshare/versions>, <https://repology.org/project/python:pickleshare/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.222 pillow: Python Imaging Library

#### Description

Pillow is the “friendly” PIL fork by Alex Clark and Contributors.

The Python Imaging Library (PIL) adds powerful image processing and graphics capabilities to Python. The library supports many file formats.

#### License

Standard PIL License

#### Upstream Contact

- Author: Alex Clark <[aclark@aclark.net](mailto:aclark@aclark.net)>
- <https://python-pillow.org/>
- Homepage: <http://python-imaging.github.io/>

#### Dependencies

- Python

#### Type

standard

#### Version Information

package-version.txt:

8.4.0
-------

install-requires.txt:

<code>pillow &gt;=7.2.0</code>
--------------------------------

## Equivalent System Packages

conda:

```
$ conda install pillow
```

macports: install the following packages: py-Pillow opensuse:

```
$ sudo zypper install python3-Pillow
```

See <https://repology.org/project/python:pillow/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.223 pint: Physical quantities module

#### Description

Physical quantities module

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/Pint/>

#### Type

optional

#### Version Information

package-version.txt:

```
0.17
```

install-requires.txt:

```
Pint
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.224 pip: Tool for installing and managing Python packages

#### Description

This package installs pip, the tool for installing and managing Python packages, such as those found in the Python Package Index. It's a replacement for easy\_install.

#### License

MIT

#### Upstream Contact

- Project Page: <https://github.com/pypa/pip>
- Install howto: <https://pip.pypa.io/en/latest/installing.html>
- Changelog: <https://pip.pypa.io/en/latest/news.html>
- Bug Tracking: <https://github.com/pypa/pip/issues>
- Mailing list: <http://groups.google.com/group/python-virtualenv>
- Docs: <https://pip.pypa.io/>

#### Dependencies

- python
- setuptools

#### Type

standard

#### Version Information

package-version.txt:

```
21.3.1
```

install-requires.txt:

```
pip >=21.3
# for use of the "in-tree-build" feature, default since 21.3, by the Sage distribution
```

## Equivalent System Packages

conda:

```
$ conda install pip
```

macports: install the following packages: py-pip opensuse:

```
$ sudo zypper install python3-pip
```

See <https://repology.org/project/pip3/versions>, <https://repology.org/project/python:pip/versions>, <https://repology.org/project/python3x-pip/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.225 pkgconf: An implementation of the pkg-config spec

#### Description

Pkgconf is an implementation of the pkg-config spec with minimal dependencies.

#### License

ISC License (equivalent to Simplified BSD)

#### Upstream Contact

<https://github.com/pkgconf/pkgconf>

#### Dependencies

- C compiler + toolchain

#### Special Update/Build Instructions

- install.patch: Use install script from AC\_PROG\_INSTALL

Pkgconf is used in bzip2, so we must not use the bzip2-compressed tarball.

#### Type

standard



## Version Information

package-version.txt:

```
0.9.7.p2
```

## Equivalent System Packages

conda:

```
$ conda install pkg-config
```

Debian/Ubuntu:

```
$ sudo apt-get install pkg-config
```

Fedora/Redhat/CentOS:

```
$ sudo yum install pkg-config
```

freebsd:

```
$ sudo pkg install devel/pkgconf
```

homebrew:

```
$ brew install pkg-config
```

macports: install the following packages: pkgconf opensuse:

```
$ sudo zypper install pkgconf
```

void:

```
$ sudo xbps-install pkgconf
```

See <https://repology.org/project/pkgconf/versions>, <https://repology.org/project/pkg-config/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.226 pkgconf: Python interface to pkg-config

### Description

Pkgconf is a Python module to interface with the pkg-config command line tool.

## License

MIT License

## Upstream Contact

<https://github.com/matze/pkgconfig>

## Type

standard

## Version Information

package-version.txt:

```
1.5.5
```

install-requires.txt:

```
pkgconfig >=1.5.1
```

## Equivalent System Packages

conda:

```
$ conda install pkgconfig
```

macports: install the following packages: py-pkgconfig opensuse:

```
$ sudo zypper install pkg-config
```

See <https://repology.org/project/python:pkgconfig/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.227 planarity: Planarity-related graph algorithms

### Description

This code project provides a library for implementing graph algorithms as well as implementations of several planarity-related graph algorithms. The origin of this project is the reference implementation for the Edge Addition Planarity Algorithm [1], which is now the fastest and simplest linear-time method for planar graph embedding and planarity obstruction isolation (i.e. Kuratowski subgraph isolation).

[1] <http://dx.doi.org/10.7155/jgaa.00091>

## License

New BSD License

## Upstream Contact

- <https://github.com/graph-algorithms/edge-addition-planarity-suite/>
- John Boyer <John.Boyer.PhD@gmail.com>

## Dependencies

None

## Special Update/Build Instructions

The tarballs can be found at, <https://github.com/graph-algorithms/edge-addition-planarity-suite/releases> sage tarball is repackaged after running autogen.sh

## Type

standard

## Version Information

package-version.txt:

```
3.0.1.0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S planarity
```

conda:

```
$ conda install planarity
```

Debian/Ubuntu:

```
$ sudo apt-get install libplanarity-dev planarity
```

Fedora/Redhat/CentOS:

```
$ sudo yum install planarity planarity-devel
```

freebsd:

```
$ sudo pkg install math/planarity
```

gentoo:

```
$ sudo emerge sci-mathematics/planarity
```

nix:

```
$ nix-env --install planarity
```

opensuse:

```
$ sudo zypper install edge-addition-planarity-suite edge-addition-planarity-suite-devel
```

See <https://repology.org/project/planarity/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.228 plantri: Generate non-isomorphic sphere-embedded graphs

### Description

Plantri is a program that generates certain types of graphs that are imbedded on the sphere.

Exactly one member of each isomorphism class is output, using an amount of memory almost independent of the number of graphs produced. This, together with the exceptionally fast operation and careful validation, makes the program suitable for processing very large numbers of graphs.

Isomorphisms are defined with respect to the embeddings, so in some cases outputs may be isomorphic as abstract graphs.

### License

Plantri is distributed without a license.

### Upstream Contact

Gunnar Brinkmann

- University of Ghent
- [Gunnar.Brinkmann@ugent.be](mailto:Gunnar.Brinkmann@ugent.be)

Brendan McKay

- Australian National University
- [bdm@cs.anu.edu.au](mailto:bdm@cs.anu.edu.au)

See <http://cs.anu.edu.au/~bdm/plantri>

**Dependencies**

- None

**Type**

optional

**Version Information**

package-version.txt:

```
4.5
```

**Equivalent System Packages**

arch:

```
$ sudo pacman -S plantri
```

See <https://repology.org/project/plantri/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

**4.1.229 pluggy: plugin and hook calling mechanisms for python****Description**

plugin and hook calling mechanisms for python

**License**

MIT license

**Upstream Contact**

<https://pypi.org/project/pluggy/>

**Type**

standard

## Version Information

package-version.txt:

1.0.0
-------

install-requires.txt:

pluggy
--------

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.230 ply: Python Lex & Yacc

#### Description

Python Lex & Yacc

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/ply/>

#### Type

standard

## Version Information

package-version.txt:

3.11
------

install-requires.txt:

ply
-----

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.231 polylib: Operations on unions of polyhedra

#### Description

The Polyhedral Library (PolyLib for short) operates on objects made up of unions of polyhedra of any dimension. polylib is a C library.

#### License

GPL v3

#### Upstream Contact

- <https://groups.google.com/forum/#!forum/isl-development>

#### Dependencies

- GMP

#### Type

optional

#### Version Information

package-version.txt:

```
5.22.5
```

## Equivalent System Packages

macports: install the following packages: polylib opensuse:

```
$ sudo zypper install polylib "pkgconfig(polylibgmp)"
```

See <https://repology.org/project/polylib/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.232 polymake: Computations with polyhedra, fans, simplicial complexes, matroids, graphs, tropical hypersurfaces

#### Description

polymake is open source software for research in polyhedral geometry. It deals with polytopes, polyhedra and fans as well as simplicial complexes, matroids, graphs, tropical hypersurfaces, and other objects. Supported platforms include various flavors of Linux, Free BSD and Mac OS.

#### License

- GPL v3

#### Upstream Contact

- <https://polymake.org/>

#### Dependencies

Polymake needs a working installation of Perl, including its shared library and some modules (XML::Writer XML::LibXML XML::LibXSLT Term::ReadLine::Gnu JSON SVG). The Polymake interface in Sage additionally needs File::Slurp. For full functionality including polymake's polyDB, also the Perl module MongoDB is needed.

These are not provided by a Sage package. The script package `perl_cpan_polymake_prereq` will signal an error at build time if the required prerequisites are not met.

The configure script will inform you about the equivalent system packages that you should install. Otherwise, you can use CPAN (see below).

Sage might install the `Term::ReadLine::Gnu` module, however, when you install polymake, if it is not provided by the system, or if Sage installs its own readline library.

A distribution-independent way to install Perl modules (into a user's home directory or `/usr/local`) is using CPAN. This is also the way to install the modules on macOS. For this, if you don't have root access, you will need the `local::lib` Perl module installed:

```
cpan -i XML::Writer XML::LibXML XML::LibXSLT File::Slurp Term::ReadLine::Gnu JSON SVG ↵  
↵MongoDB
```

Several Sage packages should be installed before installing the polymake package to give a more featureful Polymake installation:

```
sage -i 4ti2 latte_int topcom qhull
```

Software that would need to be installed manually (no Sage package available) for a more featureful Polymake installation: azove, porta, vinci, SplitsTree4.

Information on missing Polymake prerequisites after installing polymake:

```
$ sage -sh  
(sage-sh) $ polymake  
polytope> show_unconfigured;
```

It is strongly recommended to also install JuPyMake:



```
sage -i jupymake
```

When JuPyMake is present, Sage is able to use a more robust interface to Polymake.

### Debugging polymake install problems

```
# apt-get install libdevel-trace-perl
$ cd src
$ perl -d:Trace support/configure.pl
```

### Type

optional

### Version Information

package-version.txt:

```
4.5
```

### Equivalent System Packages

arch:

```
$ sudo pacman -S polymake
```

Debian/Ubuntu:

```
$ sudo apt-get install polymake libpolymake-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install polymake
```

homebrew:

```
$ brew install apaffenholz/polymake/polymake
```

nix:

```
$ nix-env --install polymake
```

opensuse:

```
$ sudo zypper install polymake
```

See <https://repology.org/project/polymake/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.233 polytopes\_db: Databases of 2- and 3-dimensional reflexive polytopes

#### Description

This package includes lists of 2- and 3-dimensional reflexive polytopes.

The list of polygons is quite easy to get and it has been known for a while. The list of 3-polytopes was originally obtained by Maximilian Kreuzer and Harald Skarke using their software PALP, which is included into the standard distribution of Sage. To work with lattice and reflexive polytopes from Sage you can use `sage.geometry.lattice_polytope` module, which relies on PALP for some of its functionality. To get access to the databases of this package, use `ReflexivePolytope` and `ReflexivePolytopes` commands.

#### License

GPL

#### Upstream Contact

<http://hep.itp.tuwien.ac.at/~kreuzer/CY/CYpalp.html>

#### Dependencies

None

#### Type

standard

#### Version Information

package-version.txt:

```
20170220.p0
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S sage-data-polytopes_db
```

conda:

```
$ conda install sagemath-db-polytopes
```

See <https://repology.org/project/sagemath-polytopes-db/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.234 polytopes\_db\_4d: Database of 4-dimensional reflexive polytopes

#### Description

This package contains the database of 4-d reflexive polytopes with Hodge numbers as index.

Based on the original list by Maximilian Kreuzer and Harald Skarke using their software PALP.

#### License

GPL v2+

#### SPKG Maintainers

Volker Braun <[vbraun.name@gmail.com](mailto:vbraun.name@gmail.com)>

#### Dependencies

None

#### Type

optional

#### Version Information

package-version.txt:

1.0
-----

#### Equivalent System Packages

See <https://repology.org/project/polytopes-db-4d/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.235 ppl: Parma Polyhedra Library

#### Description

The Parma Polyhedra Library (PPL) provides numerical abstractions especially targeted at applications in the field of analysis and verification of complex systems. These abstractions include convex polyhedra, defined as the intersection of a finite number of (open or closed) halfspaces, each described by a linear inequality (strict or non-strict) with rational coefficients; some special classes of polyhedra shapes that offer interesting complexity/precision tradeoffs; and grids which represent regularly spaced points that satisfy a set of linear congruence relations. The library also supports finite powersets and products of (any kind of) polyhedra and grids, a mixed integer linear programming problem solver using an exact-arithmetic version of the simplex algorithm, a parametric integer programming solver, and primitives for the termination analysis via the automatic synthesis of linear ranking functions.

It is written in C++, but comes with interfaces to C, Java, OCaml, and Prolog. PPL is one of the fastest implementations of polyhedral computations.

Benchmarks are included in this paper: <https://arxiv.org/abs/cs/0612085>

### License

GPL v3+

### Upstream Contact

- <https://www.bugseng.com/ppl>

Core Development Team

- Roberto Bagnara (University of Parma)
- Patricia M. Hill (University of Parma)
- Enea Zaffanella (University of Parma)

### Type

standard

### Version Information

package-version.txt:

```
1.2.p1
```

### Equivalent System Packages

arch:

```
$ sudo pacman -S ppl
```

conda:

```
$ conda install ppl
```

Debian/Ubuntu:

```
$ sudo apt-get install libppl-dev ppl-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install ppl ppl-devel
```

freebsd:

```
$ sudo pkg install devel/ppl
```

gentoo:

```
$ sudo emerge dev-libs/ppl
```

homebrew:

```
$ brew install ppl
```

macports: install the following packages: ppl nix:

```
$ nix-env --install ppl
```

opensuse:

```
$ sudo zypper install ppl-devel
```

void:

```
$ sudo xbps-install ppl-devel
```

See <https://repology.org/project/ppl/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.236 pplpy: Python interface to the Parma Polyhedra Library

#### Description

PPL Python wrapper

This Python package provides a wrapper to the C++ Parma Polyhedra Library (PPL).

The whole package started as a fork of a tiny part of the Sage software.

#### License

GPL version 3

#### Upstream Contact

- <https://github.com/videlec/pplpy>

#### Type

standard

## Version Information

package-version.txt:

```
0.8.6
```

install-requires.txt:

```
# Trac #30922: pplpy 0.8.4 and earlier do not declare dependencies correctly
pplpy >=0.8.6
```

## Equivalent System Packages

conda:

```
$ conda install pplpy
```

See <https://repology.org/project/pplpy/versions>, <https://repology.org/project/python:pplpy/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.237 pplpy\_doc: Python interface to the Parma Polyhedra Library (documentation)

#### Description

PPL Python wrapper (documentation)

#### License

GPL version 3

#### Upstream Contact

- <https://github.com/videlec/pplpy>

#### Type

standard

## Version Information

package-version.txt:

```
0.8.6
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.238 primecount: Algorithms for counting primes

#### Description

primecount is a C++ implementation of several algorithms for counting primes maintained by Kim Walisch.

Website: <https://github.com/kimwalisch/primecount/>

#### License

primecount is licensed BSD 2

#### Upstream Contact

- <https://github.com/kimwalisch/primecount/>

#### Type

standard

## Version Information

package-version.txt:

```
7.1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S primecount
```

conda:

```
$ conda install primecount
```

Fedora/Redhat/CentOS:

```
$ sudo yum install primecount primecount-devel
```

opensuse:

```
$ sudo zypper install primecount libprimecount-devel
```

See <https://repology.org/project/primecount/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.239 primecountpy: Cython interface for C++ primecount library

#### Description

Cython interface for C++ primecount library

#### License

GPLv3

#### Upstream Contact

<https://pypi.org/project/primecountpy/>

#### Type

standard

#### Version Information

package-version.txt:

```
0.1.0
```

install-requires.txt:

```
primecountpy
```

#### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>



## 4.1.240 primesieve: CLI program and C/C++ library for generating primes

### Description

A CLI program and C/C++ library for quickly generating prime numbers. <https://github.com/kimwalisch/primesieve>

A dependency of the standard spkg primecount.

### License

BSD-2-clause

### Upstream Contact

- <https://github.com/kimwalisch/primesieve>

### Type

standard

### Version Information

package-version.txt:

```
7.6
```

### Equivalent System Packages

alpine: install the following packages: primesieve-dev primesieve arch:

```
$ sudo pacman -S primesieve
```

conda:

```
$ conda install primesieve
```

Debian/Ubuntu:

```
$ sudo apt-get install libprimesieve-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install primesieve-devel primesieve
```

homebrew:

```
$ brew install primesieve
```

opensuse:

```
$ sudo zypper install primesieve
```

See <https://repology.org/project/primesieve/versions>

If the system package is installed, ./configure will check whether it can be used.

#### 4.1.241 **prometheus\_client**: Python client for the systems monitoring and alerting toolkit Prometheus

##### Description

The official Python 2 and 3 client for Prometheus (see <https://prometheus.io>), an open-source systems monitoring and alerting toolkit.

##### Type

standard

##### Version Information

package-version.txt:

```
0.11.0
```

install-requires.txt:

```
prometheus_client >=0.8.0
```

##### Equivalent System Packages

conda:

```
$ conda install prometheus_client
```

macports: install the following packages: py-prometheus\_client opensuse:

```
$ sudo zypper install python3-prometheus_client
```

See <https://repology.org/project/python:prometheus-client/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.242 `prompt_toolkit`: Interactive command lines for Python

#### Description

Library for building powerful interactive command lines in Python

[https://pypi.python.org/pypi/prompt\\_toolkit](https://pypi.python.org/pypi/prompt_toolkit)

#### Type

standard

#### Version Information

package-version.txt:

```
3.0.22
```

install-requires.txt:

```
prompt_toolkit >=3.0.5
```

#### Equivalent System Packages

conda:

```
$ conda install prompt_toolkit
```

macports: install the following packages: py-prompt\_toolkit opensuse:

```
$ sudo zypper install python3-prompt_toolkit
```

See <https://repology.org/project/python:prompt-toolkit/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.243 `ptyprocess`: Python interaction with subprocesses in a pseudoterminal

#### Description

Launch a subprocess in a pseudo terminal (pty), and interact with both the process and its pty.

Sometimes, piping stdin and stdout is not enough. There might be a password prompt that doesn't read from stdin, output that changes when it's going to a pipe rather than a terminal, or curses-style interfaces that rely on a terminal. If you need to automate these things, running the process in a pseudo terminal (pty) is the answer.

## License

Ptyprocess is under the ISC license, as code derived from Pexpect.

<http://opensource.org/licenses/ISC>

## Upstream Contact

<https://github.com/pexpect/ptyprocess>

## Dependencies

- Python

## Type

standard

## Version Information

package-version.txt:

```
0.5.1.p0
```

install-requires.txt:

```
ptyprocess ==0.5.1
# https://trac.sagemath.org/ticket/31280#comment:42 and following
# sagelib is not compatible with ptyprocess 0.5.2, 0.6, and 0.7
```

## Equivalent System Packages

conda:

```
$ conda install ptyprocess
```

macports: install the following packages: py-ptyprocess opensuse:

```
$ sudo zypper install python3-ptyprocess
```

See <https://repology.org/project/ptyprocess/versions>, <https://repology.org/project/python:ptyprocess/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

#### 4.1.244 py: library with cross-python path, ini-parsing, io, code, log facilities

##### Description

library with cross-python path, ini-parsing, io, code, log facilities

##### License

MIT license

##### Upstream Contact

<https://pypi.org/project/py/>

##### Type

standard

##### Version Information

package-version.txt:

1.10.0
--------

install-requires.txt:

py
----

##### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

#### 4.1.245 pybind11: Create Python bindings to C++ code

##### Description

**pybind11** is a lightweight header-only library that exposes C++ types in Python and vice versa, mainly to create Python bindings of existing C++ code. Its goals and syntax are similar to the excellent [Boost.Python]([http://www.boost.org/doc/libs/1\\_58\\_0/libs/python/doc/](http://www.boost.org/doc/libs/1_58_0/libs/python/doc/)) library by David Abrahams: to minimize boilerplate code in traditional extension modules by inferring type information using compile-time introspection.

## License

pybind11 is provided under a BSD-style license that can be found in the LICENSE file. By using, distributing, or contributing to this project, you agree to the terms and conditions of this license.

## Upstream Contact

<https://github.com/pybind/pybind11>

## Type

standard

## Version Information

package-version.txt:

```
2.8.1
```

install-requires.txt:

```
pybind11 >=2.5.0
```

## Equivalent System Packages

conda:

```
$ conda install pybind11
```

homebrew:

```
$ brew install pybind11
```

macports: install the following packages: py-pybind11 See <https://repology.org/project/python:pybind11/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.246 pybtex: A BibTeX-compatible bibliography processor in Python

### Description

A BibTeX-compatible bibliography processor in Python

**License**

MIT

**Upstream Contact**

<https://pypi.org/project/pybtex/>

**Type**

optional

**Version Information**

requirements.txt:

```
pybtex
```

**Equivalent System Packages**

conda:

```
$ conda install pybtex
```

macports: install the following packages: py-pybtex opensuse:

```
$ sudo zypper install python3-pybtex
```

See <https://repology.org/project/python:pybtex/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.247 pycosat: SAT solver picosat with Python bindings

**Description**

PicoSAT is a popular SAT solver written by Armin Biere in pure C. This package provides efficient Python bindings to picosat on the C level, i.e. when importing pycosat, the picosat solver becomes part of the Python process itself. For ease of deployment, the picosat source (namely picosat.c and picosat.h) is included in this project. These files have been extracted from the picosat source.

## License

MIT

## Upstream Contact

- PicoSAT: <http://fmv.jku.at/picosat/>
- pycosat: <https://github.com/ContinuumIO/pycosat>

## Dependencies

None.

## Special Update/Build Instructions

None.

## Type

optional

## Version Information

package-version.txt:

```
0.6.3
```

install-requires.txt:

```
pycosat >=0.6.3
```

## Equivalent System Packages

conda:

```
$ conda install pycosat
```

See <https://repology.org/project/pycosat/versions>, <https://repology.org/project/python:pycosat/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>



## 4.1.248 pycparser: Parser of the C language in Python

### Description

development website: <https://github.com/eliben/pycparser>

PyPI page: <https://pypi.org/project/pycparser/>

### License

BSD

### Upstream Contact

<https://github.com/eliben/pycparser>

### Type

standard

### Version Information

package-version.txt:

```
2.20
```

install-requires.txt:

```
pycparser >=2.20
```

### Equivalent System Packages

conda:

```
$ conda install pycparser
```

macports: install the following packages: py-pycparser opensuse:

```
$ sudo zypper install python3-pycparser
```

See <https://repology.org/project/pycparser/versions>, <https://repology.org/project/python:pycparser/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.249 pycryptosat: Python module of cryptominisat

### Description

Build and install pycryptosat into appropriate venv. See cryptominisat for more details.

### License

MIT License

### Upstream Contact

- Authors: Mate Soos
- Email: [soos.mate@gmail.com](mailto:soos.mate@gmail.com)
- Website: <http://www.msoos.org/>
- Releases: <https://github.com/msoos/cryptominisat/releases>

### Type

optional

### Version Information

package-version.txt:

```
5.6.8
```

install-requires.txt:

```
pycryptosat
```

### Equivalent System Packages

conda:

```
$ conda install cryptominisat
```

homebrew:

```
$ brew install cryptominisat
```

See <https://repology.org/project/cryptominisat/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.250 pycygwin: Python bindings for Cygwin’s C API

#### Description

Python bindings for Cygwin’s C API. Provides some utilities to help with the Cygwin port. Naturally, this package should only be installed on Cygwin—for other platforms its installation is a no-op.

#### Website

<https://github.com/embray/PyCygwin>

#### Type

standard

#### Version Information

package-version.txt:

```
0.1
```

install-requires.txt:

```
pycygwin >=0.1
```

#### Equivalent System Packages

See <https://repology.org/project/python:pycygwin/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.251 pyflakes: Passive checker of Python programs

#### Description

passive checker of Python programs

#### License

MIT

## Upstream Contact

<https://pypi.org/project/pyflakes/>

## Type

optional

## Version Information

requirements.txt:

```
pyflakes
```

## Equivalent System Packages

conda:

```
$ conda install pyflakes
```

macports: install the following packages: py-pyflakes opensuse:

```
$ sudo zypper install python3-pyflakes
```

See <https://repology.org/project/pyflakes/versions>, <https://repology.org/project/python:pyflakes/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.252 pygments: Generic syntax highlighter

### Description

Pygments is a syntax highlighting package written in Python.

It is a generic syntax highlighter suitable for use in code hosting, forums, wikis or other applications that need to prettify source code. Highlights are:

- a wide range of over 300 languages and other text formats is supported
- special attention is paid to details, increasing quality by a fair amount
- support for new languages and formats are added easily
- a number of output formats, presently HTML, LaTeX, RTF, SVG, all image formats that PIL supports and ANSI sequences
- it is usable as a command-line tool and as a library

## License

Modified BSD

## Upstream Contact

- Author: Georg Brandl
- Home Page: <https://pygments.org>

## Dependencies

Python

## Special Update/Build Instructions

Patches included:

- `sage_prompt.patch`: patch `pygments/lexers/agile.py` to treat the “sage:” prompt like Python’s “>>>” prompt. This allows a very kludgy patch to be removed from the Sphinx package (see #10118).

## Type

standard

## Version Information

package-version.txt:

```
2.10.0
```

install-requires.txt:

```
pygments >=2.3.1
```

## Equivalent System Packages

conda:

```
$ conda install pygments
```

homebrew:

```
$ brew install pygments
```

macports: install the following packages: `py-pygments` `opensuse`:

```
$ sudo zypper install python3-Pygments
```

See <https://repology.org/project/pygments/versions>, <https://repology.org/project/python:pygments/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.253 pygraphviz: Python interface to Graphviz

#### Description

Python interface to Graphviz

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/pygraphviz/>

#### Type

optional

#### Version Information

requirements.txt:

```
pygraphviz
```

install-requires.txt:

```
pygraphviz
```

#### Equivalent System Packages

conda:

```
$ conda install pygraphviz
```

macports: install the following packages: py-pygraphviz See <https://repology.org/project/python:pygraphviz/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.254 pynormaliz: Python bindings for the normaliz library

#### Description

The Python module PyNormaliz provides wrappers for normaliz.

#### License

- GPL v2 or later

#### Upstream Contact

<https://github.com/sebasguts/PyNormaliz>

#### Dependencies

- pip
- normaliz

#### Special Update/Build Instructions

#### Type

optional

#### Version Information

package-version.txt:

```
2.14
```

install-requires.txt:

```
pynormaliz ==2.14
```

#### Equivalent System Packages

See <https://repology.org/project/pynormaliz/versions>, <https://repology.org/project/python:pynormaliz/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.255 pyparsing: A Python parsing module

### Description

A Python Parsing Module

### License

MIT License

### Upstream Contact

- Author: Paul McGuire
- Home page: <http://pyparsing.wikispaces.com>

### Dependencies

Python

### Type

standard

### Version Information

package-version.txt:

```
3.0.6
```

install-requires.txt:

```
pyparsing >=2.3.0
```

### Equivalent System Packages

conda:

```
$ conda install pyparsing
```

opensuse:

```
$ sudo zypper install python3-pyparsing
```

See <https://repology.org/project/pyparsing/versions>, <https://repology.org/project/python:pyparsing/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>



### 4.1.256 pyrsistent: Persistent data structures in Python

#### Description

Pyrsistent is a number of persistent collections (by some referred to as functional data structures). Persistent in the sense that they are immutable.

#### License

MIT License

#### Upstream Contact

Home page: <http://github.com/tobgu/pyrsistent/>

#### Dependencies

- Python
- Setuptools
- hypothesis
- memory-profiler
- pyperform
- pytest
- Sphinx
- sphinx-rtd-theme
- tox

#### Type

standard

#### Version Information

package-version.txt:

```
0.18.0
```

install-requires.txt:

```
pyrsistent >=0.16.0
```

## Equivalent System Packages

conda:

```
$ conda install pyrsistent
```

macports: install the following packages: py-pyrsistent See <https://repology.org/project/pyrsistent/versions>, <https://repology.org/project/python:pyrsistent/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.257 pysingular: A basic Python interface to Singular

#### Description

A basic interface to call Singular from python

This python module is meant to be used in Singulars Jupyter interface.

#### License

GPL version 2 or later

#### Upstream Contact

- <https://github.com/sebasguts/SingularPython>

#### Type

optional

#### Version Information

package-version.txt:

```
0.9.7
```

install-requires.txt:

```
pysingular >=0.9.5
```

## Equivalent System Packages

conda:

```
$ conda install pysingular
```

See <https://repology.org/project/pysingular/versions>, <https://repology.org/project/python:pysingular/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.258 pytest: Simple powerful testing with Python

### Description

pytest: simple powerful testing with Python

### License

MIT

### Upstream Contact

<https://pypi.org/project/pytest/>

### Type

optional

### Version Information

requirements.txt:

```
pytest
```

## Equivalent System Packages

conda:

```
$ conda install pytest
```

macports: install the following packages: py-pytest See <https://repology.org/project/python:pytest/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.259 python3: The Python programming language

### Description

The Python programming language

### Upstream Contact

<https://www.python.org>

### Type

standard

### Version Information

package-version.txt:

```
3.9.9
```

### Equivalent System Packages

alpine: install the following packages: python3-dev cygwin:

```
$ apt-cyg install python38-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install python3 libpython3-dev python3-distutils
```

Fedora/Redhat/CentOS:

```
$ sudo yum install python3-devel
```

freebsd:

```
$ sudo pkg install lang/python
```

homebrew:

```
$ brew install python3
```

macports: install the following packages: python39 opensuse:

```
$ sudo zypper install python3-devel
```

void:

```
$ sudo xbps-install python3-devel
```

See <https://repology.org/project/python/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.260 python\_igraph: Python bindings for igraph

#### Description

igraph is a library for creating and manipulating graphs. It is intended to be as powerful (ie. fast) as possible to enable the analysis of large graphs.

#### License

GPL version 2

#### Upstream Contact

<http://igraph.org/python/>

#### Dependencies

- python
- igraph

#### Special Update/Build Instructions

##### Type

optional

#### Version Information

package-version.txt:

```
0.8.3
```

install-requires.txt:

```
python_igraph >=0.7.1999
```

#### Equivalent System Packages

conda:

```
$ conda install python-igraph
```

macports: install the following packages: py-igraph See <https://repology.org/project/python:igraph/versions>, <https://repology.org/project/python:python-igraph/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.261 pythran: Ahead of Time compiler for numeric kernels

#### Description

Ahead of Time compiler for numeric kernels

#### License

BSD 3-Clause

#### Upstream Contact

<https://pypi.org/project/pythran/>

#### Type

standard

#### Version Information

package-version.txt:

0.10.0
--------

install-requires.txt:

pythran
---------

#### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.262 pytz: Timezone definitions for Python

#### Description

World Timezone Definitions for Python See <https://pypi.org/project/pytz/>

### Special Update/Build Instructions

The upstream tarball was repackaged after sanitizing the file permissions with  
`$ chmod go-w`

### Type

standard

### Version Information

package-version.txt:

```
2021.3
```

install-requires.txt:

```
pytz >=2020.1
```

### Equivalent System Packages

conda:

```
$ conda install pytz
```

macports: install the following packages: py-tz opensuse:

```
$ sudo zypper install python3-pytz
```

See <https://repology.org/project/python:pytz/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.263 pyx: Generate PostScript, PDF, and SVG files in Python

### Description

Python package for the generation of PostScript, PDF, and SVG files

<https://pypi.python.org/pypi/PyX>

## Type

optional

## Version Information

requirements.txt:

```
pyx
```

## Equivalent System Packages

macports: install the following packages: py-pyx opensuse:

```
$ sudo zypper install python3-PyX
```

See <https://repology.org/project/python:pyx/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.264 pyzmq: Python bindings for the zeromq networking library

### Description

Python bindings for the zeromq networking library.

### License

LGPLv3+

### Upstream Contact

<http://www.zeromq.org>

### Dependencies

- Python
- Cython
- zeromq



### Special Update/Build Instructions

None.

### Type

standard

### Version Information

package-version.txt:

```
22.3.0
```

install-requires.txt:

```
pyzmq >=19.0.2
```

### Equivalent System Packages

conda:

```
$ conda install pyzmq
```

opensuse:

```
$ sudo zypper install python3-pyzmq
```

See <https://repology.org/project/pyzmq/versions>, <https://repology.org/project/python:pyzmq/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.265 qepcad: Quantifier elimination by partial cylindrical algebraic decomposition

### Description

Qepcad is an implementation of quantifier elimination by partial cylindrical algebraic decomposition

### License

QEPCAD B Copyright (c) 1990, 2008, Hoon Hong & Chris Brown (contact [wcbrown@usna.edu](mailto:wcbrown@usna.edu))

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WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

### Upstream Contact

- Website: <http://www.usna.edu/CS/qepcadweb/B/QEPCAD.html>
- Alternative location (sometimes more up-to-date):  
<https://www.usna.edu/Users/cs/wcbrown/qepcad/B/QEPCAD.html>

### Dependencies

- readline
- saclib

### Special Update/Build Instructions

One might need to set MAKE to “make -j1” for this to be built successfully.

### Type

experimental

### Version Information

package-version.txt:

B. 1. 72
----------

### Equivalent System Packages

See <https://repology.org/project/qepcad-b/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.266 qhull: Compute convex hulls, Delaunay triangulations, Voronoi diagrams

### Description

From the README.txt of Qhull:

Qhull computes convex hulls, Delaunay triangulations, Voronoi diagrams, furthest-site Voronoi diagrams, and half-space intersections about a point. It runs in 2-d, 3-d, 4-d, or higher. It implements the Quickhull algorithm for computing convex hulls. Qhull handles round-off errors from floating point arithmetic. It can approximate a convex hull.

The program includes options for hull volume, facet area, partial hulls, input transformations, randomization, tracing, multiple output formats, and execution statistics.

Further notes:

The qhull library is already shipped with the Python library scipy (from version 1.4), see

- <http://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.ConvexHull.html>
- <http://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.Delaunay.html>
- <http://docs.scipy.org/doc/scipy/reference/generated/scipy.spatial.Voronoi.html>

There is also the Python interface Pyhull available on PyPI <https://pypi.python.org/pypi/pyhull> (see also documentation at <http://pythonhosted.org/pyhull/>).

## Upstream Contact

<http://www.qhull.org/html>

C. Bradford Barber [bradb@shore.net](mailto:bradb@shore.net) or [qhull@qhull.org](mailto:qhull@qhull.org)

## Dependencies

Can be compiled with Qt support, but the Sage version currently doesn't try to do this.

## License

Not a standard license, but Sage compatible. See the COPYING.txt file in the source directory for details.

## Type

standard

## Version Information

package-version.txt:

```
2020-src-8.0.2
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S qhull
```

conda:

```
$ conda install qhull
```

cygwin:

```
$ apt-cyg install qhull
```

Debian/Ubuntu:

```
$ sudo apt-get install libqhull-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install qhull qhull-devel
```

freebsd:

```
$ sudo pkg install math/qhull
```

gentoo:

```
$ sudo emerge media-libs/qhull
```

homebrew:

```
$ brew install qhull
```

macports: install the following packages: qhull nix:

```
$ nix-env --install qhull
```

opensuse:

```
$ sudo zypper install qhull-devel
```

void:

```
$ sudo xbps-install qhull
```

See <https://repology.org/project/qhull/versions>

If the system package is installed, ./configure will check whether it can be used.

## **4.1.267 r: A free software environment for statistical computing and graphics**

### **Description**

R is a language and environment for statistical computing and graphics. It is a GNU project which is similar to the S language and environment which was developed at Bell Laboratories (formerly AT&T, now Lucent Technologies) by John Chambers and colleagues. R can be considered as a different implementation of S. There are some important differences, but much code written for S runs unaltered under R.

(taken from <http://www.r-project.org/>)

### **License**

- GPL v2 or GPL v3

## Upstream Contact

- <https://www.r-project.org>
- R mailing list, #R in IRC

## Dependencies

- GNU patch
- iconv
- Readline
- BLAS/LAPACK
- xz
- pcre
- curl
- https-capable SSL

## Type

standard

## Version Information

package-version.txt:

```
3.6.3
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S r
```

conda:

```
$ conda install r r-essentials
```

cygwin:

```
$ apt-cyg install R libtirpc-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install r-base-dev r-cran-lattice
```

Fedora/Redhat/CentOS:

```
$ sudo yum install R R-devel
```

freebsd:

```
$ sudo pkg install math/R
```

gentoo:

```
$ sudo emerge dev-lang/R
```

homebrew:

```
$ brew install r
```

macports: install the following packages: R nix:

```
$ nix-env --install R
```

opensuse:

```
$ sudo zypper install R-base
```

void:

```
$ sudo xbps-install R
```

See <https://repology.org/project/r/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.268 r\_jupyter: Jupyter kernel for R

#### Description

This package installs IRkernel, the R Jupyter kernel.

It gets installed via R's package installer on top of Jupyter.

#### License

MIT

#### Upstream Contact

- <https://github.com/IRkernel/IRkernel>
- <https://irkernel.github.io/>

## Dependencies

- R
- notebook

## Type

optional

## Version Information

## Equivalent System Packages

See <https://repology.org/project/r:irkernel/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.269 ratpoints: Find rational points on hyperelliptic curves

### Description

Michael Stoll's program which searches for rational points on hyperelliptic curves.

NOTE: the `ratpoints` package has been assimilated by PARI/GP. Therefore, this package (as Sage package) is deprecated. In the future, it will be removed from Sage.

### Upstream Contact

- Author: Michael Stoll
- Email: [Michael.Stoll@uni-bayreuth.de](mailto:Michael.Stoll@uni-bayreuth.de)
- Website: <http://www.mathe2.uni-bayreuth.de/stoll/programs/>

### Note on SSE2 instructions

- On several architectures, the SSE2 instructions used by `ratpoints` cause compiler errors. In the case that `ratpoints` fails to build with SSE2 instructions enabled, the build is repeated with SSE2 disabled.

## Type

standard

## Version Information

package-version.txt:

```
2.1.3.p5
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S ratpoints
```

conda:

```
$ conda install ratpoints
```

Debian/Ubuntu:

```
$ sudo apt-get install libratpoints-dev
```

nix:

```
$ nix-env --install ratpoints
```

See <https://repology.org/project/ratpoints/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.270 readline: Command line editing library

### Description

The GNU Readline library provides a set of functions for use by applications that allow users to edit command lines as they are typed in. Both Emacs and vi editing modes are available. The Readline library includes additional functions to maintain a list of previously-entered command lines, to recall and perhaps reedit those lines, and perform csh-like history expansion on previous commands.

Website: <http://tiswww.case.edu/php/chet/readline/rltop.html>

### License

- GPL V3+



## Upstream Contact

- Chet Ramey at <http://cnswww.cns.cwru.edu/~chet>

## Dependencies

- ncurses

## Special Update/Build Instructions

We build readline using ncurses. Readline needs to be told to link with libtinfo (part of ncurses), this is what the patch 0002-ltinfo.patch does.

## Patches

- 0001-macports.patch: Changes to shobj.conf for OS/X, from macports:  
<https://trac.macports.org/browser/trunk/dports/devel/readline/files/patch-shobj-conf.diff>
- 0002-ltinfo.patch: We build readline using ncurses, and for that it needs to be told to link with libtinfo (part of ncurses).

## Type

standard

## Version Information

package-version.txt:

```
8.0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S readline
```

conda:

```
$ conda install readline
```

cygwin:

```
$ apt-cyg install libreadline-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libreadline-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install readline-devel
```

freebsd:

```
$ sudo pkg install devel/readline
```

homebrew:

```
$ brew install readline
```

macports: install the following packages: readline nix:

```
$ nix-env --install readline
```

opensuse:

```
$ sudo zypper install readline-devel "pkgconfig(readline)"
```

slackware:

```
$ sudo slackpkg install readline
```

void:

```
$ sudo xbps-install readline-devel
```

See <https://repology.org/project/readline/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.271 requests: An HTTP library for Python

### Description

Python HTTP for Humans.

### License

Apache 2.0

### Upstream Contact

<https://pypi.org/project/requests/>

## Type

standard

## Version Information

package-version.txt:

```
2.26.0
```

install-requires.txt:

```
requests >=2.13.0
```

## Equivalent System Packages

conda:

```
$ conda install requests
```

macports: install the following packages: py-requests opensuse:

```
$ sudo zypper install python3-requests
```

See <https://repology.org/project/requests/versions>, <https://repology.org/project/python:requests/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.272 rpy2: Python interface to R

### Description

rpy2 is a redesign and rewrite of rpy. It is providing a low-level interface to R, a proposed high-level interface, including wrappers to graphical libraries, as well as R-like structures and functions.

### License

- GPL 2+
- Note that we have deleted references to Mozilla PL as an option, which we are allowed to do by the full rpy2 license in order to remain GPL-compatible

## Upstream Contact

- <https://rpy2.bitbucket.io>

## Dependencies

## Special Update/Build Instructions

## Patches

- `setup.patch`: takes care of a few parsing issues.
- `cygwin.patch`: let rpy2 build on Cygwin.

## Type

standard

## Version Information

package-version.txt:

```
3.3.6
```

install-requires.txt:

```
rpy2 >=3.3, <3.4
```

## Equivalent System Packages

conda:

```
$ conda install rpy2
```

See <https://repology.org/project/rpy2/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.273 rst2ipynb: Convert reStructuredText files to Jupyter notebooks

### Description

The `rst2pynb` program converts a standalone reStructuredText file to a Jupyter notebook file.

This is currently achieved by converting to markdown with `pandoc` and then to Jupyter notebook using `notedown`, plus some configuration and tweaks.

## License

BSD 3-Clause License

## Upstream Contact

Authors: Scott Sievert and Nicolas M. Thiéry Home page: <https://github.com/nthiery/rst-to-ipynb>

## Dependencies

- notedown
- pandoc

## Special Update/Build Instructions

Fetch tarball from <https://pypi.python.org/pypi/rst2ipynb/>

As it is written in Haskell, pandoc must be installed from the distro.

The main rationale for having a notedown package in Sage (rather than just let pip fetch it) is that the version on pipy (1.5.0, 2015-10-07) is outdated and lacks important features / fixes for us.

## Type

optional

## Version Information

package-version.txt:

0.2.3

install-requires.txt:

rst2ipynb >=0.2.2

## Equivalent System Packages

See <https://repology.org/project/python:rst2ipynb/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.274 rubiks: Programs for Rubik's cube

#### Description

There are several programs for working with Rubik's cubes, by three different people. Look inside the directories under /src to see specific info and licensing. In summary the three contributors are:

Michael Reid (GPL) [http://www.cflmath.com/~reid/Rubik/optimal\\_solver.html](http://www.cflmath.com/~reid/Rubik/optimal_solver.html)

- optimal - uses many pre-computed tables to find an optimal solution to the 3x3x3 Rubik's cube

Dik T. Winter (MIT License)

- cube - uses Kociemba's algorithm to iteratively find a short solution to the 3x3x3 Rubik's cube
- size222 - solves a 2x2x2 Rubik's cube

Eric Dietz (GPL) <https://web.archive.org/web/20121212175710/http://www.wrongway.org/?rubiksource>

- cu2 - A fast, non-optimal 2x2x2 solver
- cubex - A fast, non-optimal 3x3x3 solver
- mcube - A fast, non-optimal 4x4x4 solver

#### Type

optional

#### Version Information

package-version.txt:

```
20070912.p21
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S rubiks
```

conda:

```
$ conda install rubiks
```

nix:

```
$ nix-env --install rubiks
```

See <https://repology.org/project/rubiks/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.275 rw: Compute rank-width and rank-decompositions

#### Description

rw is a program that calculates rank-width and rank-decompositions.

<https://sourceforge.net/projects/rankwidth/>

#### License

GPL version 2 or later

#### Upstream Contact

Philipp Klaus Krause ([philipp@informatik.uni-frankfurt.de](mailto:philipp@informatik.uni-frankfurt.de))

#### Type

standard

#### Version Information

package-version.txt:

```
0.9
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S rankwidth
```

conda:

```
$ conda install rw
```

Debian/Ubuntu:

```
$ sudo apt-get install libr-w-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install rw-devel
```

freebsd:

```
$ sudo pkg install math/rankwidth
```

nix:

```
$ nix-env --install rankwidth
```

See <https://repology.org/project/rankwidth/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.276 **saclib: Computations with real algebraic numbers**

#### **Description**

Saclib is a library of C programs for computer algebra derived from the SAC2 system. It is mainly used as a dependency of qepcad.

#### **License**

Saclib 2.2 Copyright (c) 1993, 2008, RISC-Linz (contact [wcbrown@usna.edu](mailto:wcbrown@usna.edu))

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#### **Upstream Contact**

- Website: <http://www.usna.edu/CS/qepcadweb/B/QEPCAD.html>
- Alternative location (sometimes more up-to-date):  
<https://www.usna.edu/Users/cs/wcbrown/qepcad/B/QEPCAD.html>

#### **Dependencies**

None.

#### **Type**

optional



## Version Information

package-version.txt:

2.2.7
-------

## Equivalent System Packages

See <https://repology.org/project/saclib/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.277 sage\_conf: Configuration module for the SageMath library (distributable version)

### Description

This distribution package provides:

- a single Python module, `sage_conf`, providing configuration information to the SageMath library at the time of its installation and at its runtime
- a console script `sage-config`, for querying the variables of `sage_conf` from the shell
- a sourcable shell script `sage-env-config`, providing additional configuration information in the form of environment variables

The `sage_conf` distribution package is polymorphic: It has several implementations.

### sage\_conf sdist on PyPI

This implementation of the `sage_conf` distribution package comes from <https://trac.sagemath.org/ticket/29039>, which added the directory `pkgs/sage-conf_pypi`.

To install, use `pip install -v sage_conf`. Using `-v` ensures that diagnostic messages are displayed.

On installation (or building a wheel), it invokes `sage_bootstrap` to establish a build tree (`SAGE_ROOT`) and installation tree (`SAGE_LOCAL`) for the SageMath distribution. By default, it uses a subdirectory of `$HOME/.sage` that is specific to the version of the distribution and the version of Python in use. If several virtual environments over the same version of Python install `sage_conf`, they will share these trees.

After installation of `sage_conf`, a wheelhouse containing wheels of various libraries is available; type `ls $(sage-config SAGE_SPKG_WHEELS)` to list them and `pip install $(sage-config SAGE_SPKG_WHEELS)/*.whl` to install them. After this, you can install the Sage library, for example, using `pip install sagemath-standard`.

## sage\_conf wheels

Prebuilt binary wheels of the `sage_conf` distribution package are available at <https://github.com/sagemath/sage-wheels/releases/>

This implementation of `sage_conf` comes from <https://trac.sagemath.org/ticket/31396>, which adds the directory `pkgs/sage-conf_relocatable/`.

On building a wheel, it invokes `sage_bootstrap` to establish a build and installation tree (`SAGE_ROOT`, `SAGE_LOCAL`) in a subdirectory of the directory `/var/tmp/`, whose name is specific to the version of the distribution and the version of Python in use.

The wheel distributes a copy of the prebuilt `SAGE_ROOT` and `SAGE_LOCAL`. Importing `sage_conf` (or using the installed `sage-config` script), makes sure that a symlink from the `/var/tmp` location to the actual persistent installation location is created. As the relocated libraries and programs contain the hardcoded path `SAGE_LOCAL` in various ways (including as `rpaths`), this symlink is necessary for the prebuilt libraries and programs to work.

`/var/tmp` is a sticky directory on all Linux distributions following the Filesystem Hierarchy Standard, as well as on macOS and on Cygwin. On multi-user systems, only one user can use a given version of the distribution; other installation schemes are recommended for systems with multiple Sage users.

## sage\_conf in the SageMath distribution

The original version of the distribution package `sage_conf` is used internally in the SageMath distribution. It is provided in the directory `pkgs/sage-conf`. This version of the package is generated by the Sage distribution's `configure` script.

## sage\_conf in downstream distributions

Downstream packagers and advanced developers and users may want to provide their own implementation of the distribution package to support the intended deployment of the SageMath library.

## License

GNU General Public License (GPL) v3 or later

## Upstream Contact

<https://www.sagemath.org>

This package is included in the source code of the Sage distribution, in `pkgs/sage-conf*`.

## Type

standard

## Version Information

package-version.txt:

```
9.5
```

install-requires.txt:

```
sage-conf ~= 9.5.b6
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.278 Sage: Open Source Mathematics Software: Build system of the Sage documentation

### About SageMath

**“Creating a Viable Open Source Alternative to Magma, Maple, Mathematica, and MATLAB”**

Copyright (C) 2005-2020 The Sage Development Team

<https://www.sagemath.org>

SageMath fully supports all major Linux distributions, recent versions of macOS, and Windows (using Cygwin or Windows Subsystem for Linux).

The traditional and recommended way to install SageMath is from source via Sage-the-distribution (<https://www.sagemath.org/download-source.html>). Sage-the-distribution first builds a large number of open source packages from source (unless it finds suitable versions installed in the system) and then installs the Sage Library (sagelib, implemented in Python and Cython).

### About this pip-installable source distribution

This is the build system of the Sage documentation, based on Sphinx.

### Type

standard

## Version Information

package-version.txt:

```
9.5
```

install-requires.txt:

```
sage_docbuild
```

## Equivalent System Packages

See <https://repology.org/project/sage-docbuild/versions>, <https://repology.org/project/python:sage-docbuild/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.279 `sage_flatsurf`: computation with flat surfaces

#### Description

SageMath package for studying the geometry of flat surfaces and the dynamics of their foliations.

#### License

GNU General Public License, version 2

#### Upstream Contact

<https://pypi.org/project/sage-flatsurf/>

#### Type

optional

#### Version Information

requirements.txt:

sage-flatsurf
---------------

## Equivalent System Packages

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.280 `sage_numerical_backends_coin`: COIN-OR backend for Sage `MixedIntegerLinearProgram`

#### Description

COIN-OR backend for Sage `MixedIntegerLinearProgram`

**License**

GPLv2+

**Upstream Contact**

<https://pypi.org/project/sage-numerical-backends-coin/>

**Type**

optional

**Version Information**

package-version.txt:

9.0b12
--------

install-requires.txt:

sage_numerical_backends_coin >=9.0b12
---------------------------------------

**Equivalent System Packages**

See <https://repology.org/project/sage-numerical-backends-coin/versions>, <https://repology.org/project/python:sage-numerical-backends-coin/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.281 sage\_numerical\_backends\_cplex: Cplex backend for Sage MixedIntegerLinearProgram****Description**

Cplex backend for Sage MixedIntegerLinearProgram

**License**

GPLv2+

### Upstream Contact

<https://pypi.org/project/sage-numerical-backends-cplex/>

### Type

optional

### Version Information

package-version.txt:

9.0b12

install-requires.txt:

sage\_numerical\_backends\_cplex >=9.0b12

### Equivalent System Packages

See <https://repology.org/project/python:sage-numerical-backends-cplex/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.282 `sage_numerical_backends_gurobi`: Gurobi backend for Sage MixedIntegerLinearProgram

### Description

Gurobi backend for Sage MixedIntegerLinearProgram

### License

GPLv2+

### Upstream Contact

<https://pypi.org/project/sage-numerical-backends-gurobi/>

**Type**

optional

**Version Information**

package-version.txt:

```
9.3.1
```

install-requires.txt:

```
sage_numerical_backends_gurobi >=9.0.0
```

**Equivalent System Packages**

See <https://repology.org/project/sage-numerical-backends-gurobi/versions>, <https://repology.org/project/python:sage-numerical-backends-gurobi/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.283 sage-setup: Build system of the SageMath library**

This is the build system of the Sage library, based on setuptools.

**Type**

standard

**Version Information**

package-version.txt:

```
9.5
```

install-requires.txt:

```
sage-setup
```

**Equivalent System Packages**

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

#### 4.1.284 `sage_sws2rst`: Translate legacy Sage worksheet files (.sws) to reStructuredText (.rst) files

##### Description

Provides a script `sage - sws2rst`, which translates a Sage worksheet file (.sws) into a reStructuredText (.rst) file.

Sage worksheet files (.sws) are a file format that was used by the now-obsolete Sage notebook (<https://github.com/sagemath/sagenb>), superseded by the Jupyter notebook. SageNB was dropped in the course of the transition of SageMath to Python 3.

This package was extracted from the SageNB sources in <https://trac.sagemath.org/ticket/28838> to provide a way to convert pedagogical material written available in Sage worksheet format.

##### Type

optional

##### Version Information

package-version.txt:

9.5
-----

install-requires.txt:

sage_sws2rst
--------------

##### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

#### 4.1.285 `sagemath_doc_html`: SageMath documentation in HTML format

Upon installation, this package builds the SageMath documentation in HTML format.

It is a standard package. It is built on every invocation of `make` or `make all`, but not on `make build`. The documentation build can also be run separately using `make doc-html`.

##### Type

standard



## Version Information

### Equivalent System Packages

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

#### 4.1.286 `sagemath_doc_pdf`: SageMath documentation in PDF format

Upon installation, this package builds the SageMath documentation in PDF format.

It is an optional package. It can be enabled at configuration time using `./configure --enable-sagemath_doc_pdf`. Alternatively, it can be installed by using `make doc-pdf`.

## Type

optional

## Version Information

### Equivalent System Packages

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

#### 4.1.287 `sagenb_export`: Convert legacy SageNB notebooks to Jupyter notebooks and other formats

## Description

This is a tool to convert SageNB notebooks to other formats, in particular IPython/Jupyter notebooks.

It includes a Jupyter notebook extension to provide a UI for the import of SageNB notebooks.

## Upstream Contact

<https://github.com/vbraun/ExportSageNB>

## Type

standard

## Version Information

package-version.txt:

```
3.3
```

install-requires.txt:

```
sagenb_export >=3.3
```

## Equivalent System Packages

See <https://repology.org/project/sagenb-export/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.288 sagetex: Embed code, results of computations, and plots from Sage into LaTeX documents

### Description

The SageTeX package allows you to embed code, results of computations, and plots from Sage into LaTeX documents.

### License

The *source code* of the SageTeX package may be redistributed and/or modified under the terms of the GNU General Public License as published by the Free Software Foundation, either version 2 of the License, or (at your option) any later version. To view a copy of this license, see <http://www.gnu.org/licenses/> or send a letter to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.

The *documentation* of the SageTeX package is licensed under the Creative Commons Attribution-Share Alike 3.0 License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/3.0/> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.

### SPKG Maintainers

Dan Drake (dr.dan.drake at gmail) and SageMath developers ([sage-devel@googlegroups.com](mailto:sage-devel@googlegroups.com))

### Upstream Contact

Author: Dan Drake.

Web: <https://github.com/sagemath/sagetex>

## Dependencies

To install, nothing more than a standard Sage install. The `spkg-check` script will exit without actually testing anything if it cannot find “`latex`” in your path.

## Notes

To use SageTeX, both Sage and LaTeX need to know about it. SageTeX comes standard with Sage, so you only need to make sure LaTeX can find what it needs. Full details are in the Sage installation guide at <http://doc.sagemath.org/html/en/installation/> and <http://doc.sagemath.org/html/en/tutorial/sagetex.html>.

The directory `$SAGE_ROOT/local/share/doc/sagetex` contains documentation and an example file. See `$SAGE_ROOT/local/share/texmf/tex/latex/sagetex` for the source code and some possibly useful scripts. If you have problems or suggestions see [the sage-support group](#).

If you want to help develop SageTeX, please clone the github repository (see the “Upstream Contact” above) and send me patches based on that.

## Type

standard

## Version Information

package-version.txt:

```
3.5
```

install-requires.txt:

```
sagetex >=3.5
```

## Equivalent System Packages

conda:

```
$ conda install sagetex
```

See <https://repology.org/project/sagetex/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.289 scipoptsuite: Mixed integer programming solver

#### Description

SCIP is currently one of the fastest non-commercial mixed integer programming (MIP) solvers. It is also a framework for constraint integer programming and branch-cut-and-price. It allows total control of the solution process and the access of detailed information down to the guts of the solver.

#### License

ZIB Academic License

The ZIB Academic License allows the use of software distributed under this license without charge for research purposes as a member of a non-commercial and academic institution, e.g., a university. The software is available with its source code.

<http://scip.zib.de/academic.txt>

#### SPKG Maintainers

- Martin Albrecht (original spkg)
- Matthias Koeppel (updates for new spkg style)

#### Upstream Contact

<http://scip.zib.de/doc/html/AUTHORS.shtml>

#### Dependencies

cmake

#### Special Update/Build Instructions

We do not have permission to redistribute SCIP or SoPlex. Hence, you must download it yourself from <http://scip.zib.de> and put the tarball `scipoptsuite-VERSION.tgz` in `$SAGE_ROOT/upstream`, renaming it to `scipoptsuite-VERSION-do-not-distribute.tgz`.

#### Type

experimental

## Version Information

package-version.txt:

5.0.1
-------

## Equivalent System Packages

See <https://repology.org/project/scipoptsuite/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.290 scipy: Scientific tools for Python

### Description

SciPy (pronounced “Sigh Pie”) is open-source software for mathematics, science, and engineering. The SciPy library depends on NumPy, which provides convenient and fast N-dimensional array manipulation. The SciPy library is built to work with NumPy arrays, and provides many user-friendly and efficient numerical routines such as routines for numerical integration and optimization. Together, they run on all popular operating systems, are quick to install, and are free of charge. NumPy and SciPy are easy to use, but powerful enough to be depended upon by some of the world’s leading scientists and engineers.

### License

SciPy’s license is free for both commercial and non-commercial use, under the BSD terms. See [http://www.scipy.org/License\\_Compatibility](http://www.scipy.org/License_Compatibility)

### Upstream Contact

<https://www.scipy.org/>

### Dependencies

- Python, which in Sage has numerous dependencies
- Numpy
- Fortran
- GNU patch

## Special Update/Build Instructions

- None.

## Type

standard

## Version Information

package-version.txt:

```
1.7.2
```

install-requires.txt:

```
scipy >=1.5, <1.8
```

## Equivalent System Packages

conda:

```
$ conda install scipy
```

homebrew:

```
$ brew install scipy
```

macports: install the following packages: py-scipy opensuse:

```
$ sudo zypper install python3-scipy
```

See <https://repology.org/project/python:scipy/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.291 send2trash: Send file to trash natively under Mac OS X, Windows and Linux

### Description

Send file to trash natively under Mac OS X, Windows and Linux.

## License

BSD License

## Upstream Contact

<https://pypi.org/project/Send2Trash/>

## Type

standard

## Version Information

package-version.txt:

```
1.8.0
```

install-requires.txt:

```
send2trash >=1.5.0
```

## Equivalent System Packages

conda:

```
$ conda install send2trash
```

macports: install the following packages: py-send2trash opensuse:

```
$ sudo zypper install python3-Send2Trash
```

See <https://repology.org/project/send2trash/versions>, <https://repology.org/project/python:send2trash/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.292 setuptools: Build system for Python packages

### Description

setuptools is a collection of enhancements to the Python distutils (for Python 2.6 and up) that allow you to more easily build and distribute Python packages, especially ones that have dependencies on other packages.

Website: <http://pypi.python.org/pypi/setuptools/>

## License

PSF or ZPL. i.e Python Software Foundation License or Zope Public License

## Upstream Contact

- Phillip J. Eby ([distutils-sig@python.org](mailto:distutils-sig@python.org))

## Dependencies

- python

## Type

standard

## Version Information

package-version.txt:

```
59.2.0
```

install-requires.txt:

```
setuptools >=49.6.0
```

## Equivalent System Packages

conda:

```
$ conda install setuptools
```

macports: install the following packages: py-setuptools opensuse:

```
$ sudo zypper install python3-setuptools
```

See <https://repology.org/project/python:setuptools/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.293 setuptools\_scm: Python build system extension to obtain package version from version control

### Description

the blessed package to manage your versions by scm tags



**License**

MIT

**Upstream Contact**

<https://pypi.org/project/setuptools-scm/>

**Type**

standard

**Version Information**

package-version.txt:

```
6.3.2
```

install-requires.txt:

```
setuptools_scm >=4.1.2
```

**Equivalent System Packages**

conda:

```
$ conda install setuptools_scm
```

macports: install the following packages: py-setuptools\_scm opensuse:

```
$ sudo zypper install python3-setuptools_scm
```

See <https://repology.org/project/python:setuptools-scm/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.294 setuptools\_scm\_git\_archive: setuptools\_scm plugin for git archives****Description**

setuptools\_scm plugin for git archives

## License

MIT

## Upstream Contact

<https://pypi.org/project/setuptools-scm-git-archive/>

## Type

standard

## Version Information

package-version.txt:

```
1.1
```

install-requires.txt:

```
setuptools-scm-git-archive
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.295 setuptools\_wheel: Build the setuptools package as a wheel

After installing setuptools and wheel, we build a wheel of setuptools to complete the set of wheels stored in our wheel-house.

## Type

standard

## Version Information

package-version.txt:

```
59.2.0
```

install-requires.txt:

```
# We use this file to mark the package as a Python package
```

## Equivalent System Packages

See <https://repology.org/project/python:setuptools/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.296 simplegeneric: Simple single-dispatch generic functions for Python

#### Description

Simple generic functions (similar to Python's own `len()`, `pickle.dump()`, etc.)

The `simplegeneric` module lets you define simple single-dispatch generic functions, akin to Python's built-in generic functions like `len()` `iter()` and so on. However, instead of using specially-named methods, these generic functions use simple lookup tables, akin to those used by e.g. `pickle.dump()` and other generic functions found in the Python standard library.

As you can see from the above examples, generic functions are actually quite common in Python already, but there is no standard way to create simple ones. This library attempts to fill that gap, as generic functions are an excellent alternative to the Visitor pattern, as well as being a great substitute for most common uses of adaptation.

This library tries to be the simplest possible implementation of generic functions, and it therefore eschews the use of multiple or predicate dispatch, as well as avoiding speedup techniques such as C dispatching or code generation. But it has absolutely no dependencies, other than Python 2.4, and the implementation is just a single Python module of less than 100 lines.

#### Type

standard

#### Version Information

package-version.txt:

```
0.8.1.p0
```

install-requires.txt:

```
simplegeneric >=0.8.1
```

## Equivalent System Packages

conda:

```
$ conda install simplegeneric
```

macports: install the following packages: `py-simplegeneric` `opensuse`:

```
$ sudo zypper install python3-simplegeneric
```

See <https://repology.org/project/simplegeneric/versions>, <https://repology.org/project/python:simplegeneric/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.297 singular: Computer algebra system for polynomial computations, algebraic geometry, singularity theory

#### Description

Singular is a computer algebra system for polynomial computations, with special emphasis on commutative and non-commutative algebra, algebraic geometry, and singularity theory.

#### License

GPLv2 or GPLv3

#### Upstream Contact

[libsingular-devel@mathematik.uni-kl.de](mailto:libsingular-devel@mathematik.uni-kl.de)

<https://www.singular.uni-kl.de/>

#### Special Update/Build Instructions

Other notes:

- If the environment variable SAGE\_DEBUG is set to “yes”, then omalloc will be replaced by xalloc. The resulting Singular executable and libsingular library will be slower than with omalloc, but allow for easier debugging of memory corruptions.

#### Type

standard

#### Version Information

package-version.txt:

4.2.1p3
---------

## Equivalent System Packages

arch:

```
$ sudo pacman -S singular
```

conda:

```
$ conda install singular
```

cygwin:

```
$ apt-cyg install singular-devel singular
```

Debian/Ubuntu:

```
$ sudo apt-get install singular libsingular4-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install Singular Singular-devel
```

freebsd:

```
$ sudo pkg install math/singular
```

gentoo:

```
$ sudo emerge sci-mathematics/singular[readline]
```

homebrew:

```
$ brew install singular
```

macports: install the following packages: singular nix:

```
$ nix-env --install singular
```

See <https://repology.org/project/singular/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.298 singular\_jupyter: Jupyter kernel for Singular

#### Description

This is a beta version of a jupyter kernel for Singular.

## License

GPL version 2 or later

## Upstream Contact

- [https://github.com/sebasguts/jupyter\\_kernel\\_singular](https://github.com/sebasguts/jupyter_kernel_singular)

## Type

optional

## Version Information

package-version.txt:

```
0.9.7
```

install-requires.txt:

```
singular_jupyter >=0.9.7
```

## Equivalent System Packages

conda:

```
$ conda install jupyter-kernel-singular
```

See <https://repology.org/project/jupyter-singular/versions>, <https://repology.org/project/python:jupyter-kernel-singular/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.299 sip: Python extension module generator for C and C++ libraries

### Description

Python extension module generator for C and C++ libraries

### Upstream contact

- <https://www.riverbankcomputing.com/software/sip/>
- <https://pypi.python.org/pypi/SIP>

## License

SIP is released under the GPL v2, GPL v3 licenses, and under a license similar to the BSD license.

SIP is copyright (c) Riverbank Computing Limited. Its homepage is <https://www.riverbankcomputing.com/software/sip/>.

## Type

optional

## Version Information

package-version.txt:

```
4.18
```

## Equivalent System Packages

conda:

```
$ conda install sip
```

homebrew:

```
$ brew install sip
```

macports: install the following packages: py-sip See <https://repology.org/project/python:sip/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.300 sirocco: Compute topologically certified root continuation of bivariate polynomials

### Description

sirocco is a library to compute topologically certified root continuation of bivariate polynomials.

### License

GPLv3+

## SPKG Maintainers

- Miguel Marco

## Upstream Contact

Miguel Marco ([mmarco@unizar.es](mailto:mmarco@unizar.es))

## Dependencies

- gcc

## Type

optional

## Version Information

package-version.txt:

```
2.1.0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S sirocco
```

opensuse:

```
$ sudo zypper install sirocco-devel
```

See <https://repology.org/project/sirocco/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.301 six: Python 2 and 3 compatibility utilities

### Description

Python 2 and 3 compatibility utilities



## License

MIT License

## Upstream Contact

- Author: Benjamin Peterson
- Home page: <http://pypi.python.org/pypi/six/>

## Dependencies

Python

## Type

standard

## Version Information

package-version.txt:

```
1.16.0
```

install-requires.txt:

```
six >=1.15.0
```

## Equivalent System Packages

conda:

```
$ conda install six
```

macports: install the following packages: py-six opensuse:

```
$ sudo zypper install python3-six
```

See <https://repology.org/project/python:six/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.302 slabbe: Sébastien Labbé’s Research code

#### Description

This SageMath package contains various modules for experimentation with

- discrete dynamical systems
- combinatorics
- digital geometry
- visualization
- miscellaneous development tools

#### License

GPLv2+

#### Upstream Contact

<https://pypi.org/project/slabbe/>

#### Type

optional

#### Version Information

requirements.txt:

slabbe
--------

#### Equivalent System Packages

See <https://repology.org/project/python:slabbe/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.303 snappy: Topology and geometry of 3-manifolds, with a focus on hyperbolic structures

#### Description

Studying the topology and geometry of 3-manifolds, with a focus on hyperbolic structures.

**License**

GPLv2+

**Upstream Contact**<https://pypi.org/project/snappy/>**Type**

optional

**Version Information**

requirements.txt:

```
# Note: As of 2021-01, snappy will pull in cypari (!= cypari2) as a dependency
# if installed as a wheel but will actually use Sage's cypari2.
# cypari contains a statically linked copy of pari and other libraries
# and will remain completely unused (wastes 30M). Snappy is about 165M.
# See https://trac.sagemath.org/ticket/31180
snappy
# cypari 2.4.0 has a broken sdist, https://trac.sagemath.org/ticket/31180
cypari !=2.4.0
# An optional database (110M uncompressed)
snappy_15_knots
```

**Equivalent System Packages**

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.304 snowballstemmer: Stemmer algorithms for natural language processing in Python

**Description**

This package provides 29 stemmers for 28 languages generated from Snowball algorithms.

**License**

BSD-3-Clause

## Upstream Contact

<https://pypi.org/project/snowballstemmer/>

This is a pure Python stemming library. If PyStemmer is available, this module uses it to accelerate.

## Type

standard

## Version Information

package-version.txt:

```
2.1.0
```

install-requires.txt:

```
snowballstemmer >=1.2.1
```

## Equivalent System Packages

conda:

```
$ conda install snowballstemmer
```

macports: install the following packages: py-snowballstemmer opensuse:

```
$ sudo zypper install python3-snowballstemmer
```

See <https://repology.org/project/python:snowballstemmer/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.305 speaklater: Lazy strings for Python

### Description

Implements a lazy string for python useful for use with gettext

A module that provides lazy strings for translations. Basically you get an object that appears to be a string but changes the value every time the value is evaluated based on a callable you provide.

For example you can have a global lazy\_gettext function that returns a lazy string with the value of the current set language.

## Type

optional

## Version Information

package-version.txt:

```
1.3.p0
```

install-requires.txt:

```
speaklater >=1.3
```

## Equivalent System Packages

conda:

```
$ conda install speaklater
```

macports: install the following packages: py-speaklater opensuse:

```
$ sudo zypper install python3-speaklater
```

See <https://repology.org/project/speaklater/versions>, <https://repology.org/project/python:speaklater/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.306 sphinx: Python documentation generator

### Description

Sphinx is a tool that makes it easy to create intelligent and beautiful documentation for Python projects (or other documents consisting of multiple reStructuredText sources), written by Georg Brandl. It was originally created to translate the new Python documentation, but has now been cleaned up in the hope that it will be useful to many other projects.

### License

Modified BSD; see e.g. its egg-info file for other options

## Upstream Contact

- Author: Georg Brandl
- Home Page: <http://www.sphinx-doc.org>
- see also <http://pypi.python.org/pypi/Sphinx>

## Dependencies

- six  $\geq$  1.4
- Jinja2  $\geq$  2.3
- Pygments  $\geq$  2.0
- docutils  $\geq$  0.11
- snowballstemmer  $\geq$  1.1
- babel  $\geq$  1.3
- setuptools / distribute
- Python
- GNU patch (shipped with Sage)

## Special Update/Build Instructions

- The script `create_grammar_pickle.py` creates the file `Grammar2.7.pickle` in `site-packages/Sphinx-.../sphinx/pycode/`. This helps to avoid race conditions when building the documentation in parallel.

## Type

standard

## Version Information

package-version.txt:

4.2.0
-------

install-requires.txt:

sphinx $\geq$ 4, $<$ 4.3
--------------------------

## Equivalent System Packages

conda:

```
$ conda install sphinx
```

homebrew:

```
$ brew install sphinx-doc
```

macports: install the following packages: py-sphinx opensuse:

```
$ sudo zypper install python3-Sphinx
```

See <https://repology.org/project/python:sphinx/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.307 sphinxcontrib\_applehelp: Sphinx extension which outputs Apple help book

#### Description

Sphinx extension which outputs Apple help book

#### License

BSD

#### Type

standard

#### Version Information

package-version.txt:

```
1.0.2
```

install-requires.txt:

```
sphinxcontrib_applehelp >=1.0.2
```

## Equivalent System Packages

conda:

```
$ conda install sphinxcontrib-applehelp
```

macports: install the following packages: py-sphinxcontrib-applehelp opensuse:

```
$ sudo zypper install python3-sphinxcontrib-applehelp
```

See <https://repology.org/project/python:sphinxcontrib-applehelp/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.308 sphinxcontrib\_devhelp: Sphinx extension which outputs Devhelp documents

#### Description

Sphinx extension which outputs Devhelp documents

#### License

BSD

#### Type

standard

#### Version Information

package-version.txt:

```
1.0.2
```

install-requires.txt:

```
sphinxcontrib_devhelp >=1.0.2
```

## Equivalent System Packages

conda:

```
$ conda install sphinxcontrib-devhelp
```

macports: install the following packages: py-sphinxcontrib-devhelp See <https://repology.org/project/python:sphinxcontrib-devhelp/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>



**4.1.309 sphinxcontrib\_htmlhelp: Sphinx extension which outputs HTML help book****Description**

Sphinx extension which outputs HTML help book

**License**

BSD

**Type**

standard

**Version Information**

package-version.txt:

```
2.0.0
```

install-requires.txt:

```
sphinxcontrib_htmlhelp >=1.0.3
```

**Equivalent System Packages**

conda:

```
$ conda install sphinxcontrib-htmlhelp
```

macports: install the following packages: py-sphinxcontrib-htmlhelp See <https://repology.org/project/python:sphinxcontrib-htmlhelp/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.310 sphinxcontrib\_jsmath: Sphinx extension which renders display math in HTML via JavaScript****Description**

Sphinx extension which renders display math in HTML via JavaScript

## License

BSD

## Type

standard

## Version Information

package-version.txt:

```
1.0.1
```

install-requires.txt:

```
sphinxcontrib_jsmath >=1.0.1
```

## Equivalent System Packages

conda:

```
$ conda install sphinxcontrib_jsmath
```

macports: install the following packages: py37-sphinxcontrib-jsmath See <https://repology.org/project/python:sphinxcontrib-jsmath/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.311 sphinxcontrib\_qthelp: Sphinx extension which outputs QtHelp documents

### Description

Sphinx extension which outputs QtHelp documents

## License

BSD

## Type

standard

## Version Information

package-version.txt:

```
1.0.3
```

install-requires.txt:

```
sphinxcontrib_qthelp >=1.0.3
```

## Equivalent System Packages

conda:

```
$ conda install sphinxcontrib-qthelp
```

macports: install the following packages: py-sphinxcontrib-qthelp See <https://repology.org/project/python:sphinxcontrib-qthelp/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.312 sphinxcontrib\_serializinghtml: Sphinx extension which outputs serialized HTML files

#### Description

Sphinx extension which outputs serialized HTML files

#### License

BSD

#### Type

standard

## Version Information

package-version.txt:

```
1.1.5
```

install-requires.txt:

```
sphinxcontrib_serializinghtml >=1.1.4
```

## Equivalent System Packages

conda:

```
$ conda install sphinxcontrib-serializinghtml
```

macports: install the following packages: py-sphinxcontrib-serializinghtml opensuse:

```
$ sudo zypper install python3-sphinxcontrib-serializinghtml
```

See <https://repology.org/project/python:sphinxcontrib-serializinghtml/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.313 sphinxcontrib\_websupport: Sphinx API for Web apps

#### Description

sphinxcontrib-websupport provides a Python API to easily integrate Sphinx documentation into your Web application.

#### License

BSD

#### Type

standard

#### Version Information

package-version.txt:

```
1.2.1
```

install-requires.txt:

```
sphinxcontrib_websupport >=1.2.1
```

## Equivalent System Packages

conda:

```
$ conda install sphinxcontrib-websupport
```

macports: install the following packages: py-sphinxcontrib-websupport opensuse:

```
$ sudo zypper install python3-sphinxcontrib-websupport
```

See <https://repology.org/project/python:sphinxcontrib-websupport/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.314 sqlalchemy: A database abstraction library

#### Description

Database Abstraction Library

#### License

MIT

#### Upstream Contact

<https://pypi.org/project/SQLAlchemy/>

#### Type

optional

#### Version Information

requirements.txt:

```
sqlalchemy
```

#### Equivalent System Packages

conda:

```
$ conda install sqlalchemy
```

macports: install the following packages: py-sqlalchemy opensuse:

```
$ sudo zypper install python3-SQLAlchemy
```

See <https://repology.org/project/python:sqlalchemy/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.315 sqlite: An SQL database engine

#### Description

SQLite is a software library that implements a self-contained, serverless, zero-configuration, transactional SQL database engine.

#### License

Public Domain

#### Upstream contact

- <https://www.sqlite.org>

#### Dependencies

- readline

#### Special Update/Build Instructions

- Use the autoconf version of sqlite.

#### Type

standard

#### Version Information

package-version.txt:

```
3.36.0
```

#### Equivalent System Packages

arch:

```
$ sudo pacman -S sqlite3
```

conda:

```
$ conda install sqlite
```

cygwin:

```
$ apt-cyg install libsqlite3-devel sqlite3
```

Debian/Ubuntu:

```
$ sudo apt-get install libsqlite3-dev sqlite3
```

Fedora/Redhat/CentOS:

```
$ sudo yum install sqlite-devel sqlite
```

freebsd:

```
$ sudo pkg install databases/sqlite3
```

gentoo:

```
$ sudo emerge dev-db/sqlite
```

homebrew:

```
$ brew install sqlite
```

macports: install the following packages: sqlite3 nix:

```
$ nix-env --install sqlite
```

opensuse:

```
$ sudo zypper install "pkgconfig(sqlite3)"
```

slackware:

```
$ sudo slackpkg install sqlite icu4c
```

void:

```
$ sudo xbps-install sqlite-devel
```

See <https://repology.org/project/sqlite/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.316 suitesparse: A suite of sparse matrix software

SuiteSparse is a collection of software to deal with sparse matrix. It is hosted at <http://faculty.cse.tamu.edu/davis/suitesparse.html>

This spkg does a minimal install of suitesparse disabling the following

- metis
- GraphBLAS (need cmake)
- Mongoose (need cmake)

An external metis package can be used but we just disable its use.

Patches:

- The first patch disable the building of package using cmake.
- The second patch make sure we use sage's blas/lapack on OS X. By default suitesparse discard any configurations to use the accelerate framework.

The building of metis is disabled by passing MY\_METIS\_LIB=none to make (any value would have done) We also configure cholmod so it doesn't require metis by passing CHOLMOD\_CONFIG=-DNPARTITION to make.

Other configurations are self explanatory.

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Availability:

<http://www.suitesparse.com>

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### Type

standard

## Version Information

package-version.txt:

```
5.10.1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S suitesparse
```

conda:

```
$ conda install suitesparse
```

cygwin:

```
$ apt-cyg install libsuitesparseconfig-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libsuitesparse-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install suitesparse suitesparse-devel
```

freebsd:

```
$ sudo pkg install math/suitesparse
```

gentoo:

```
$ sudo emerge sci-libs/amd sci-libs/cholmod sci-libs/suitesparseconfig sci-libs/umfpack
```

homebrew:

```
$ brew install suite-sparse
```

macports: install the following packages: SuiteSparse opensuse:

```
$ sudo zypper install suitesparse-devel
```

See <https://repology.org/project/suitesparse/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.317 surf: Visualization of algebraic curves, algebraic surfaces and hyperplane sections of surfaces

#### Description

surf is a tool to visualize some real algebraic geometry: plane algebraic curves, algebraic surfaces and hyperplane sections of surfaces. surf is script driven and has (optionally) a nifty GUI using the Gtk widget set.

This is used by the Singular Jupyter kernel to produce 3D plots.

#### License

GPL version 2 or later

#### Upstream Contact

<http://surf.sourceforge.net> (although the project is essentially dead)

#### Dependencies

- cups (optional)
- GNU flex Version 2.5 or higher
- GTK+ Version 1.2.0 or higher (optional)
- POSIX Threads
- GNU MP(gmp) Version 2 or higher
- lib-tiff
- lib-jpeg
- zlib
- ps2pdf (optional)

This package is “experimental” because not all of these dependencies are packaged with Sage.

#### Type

experimental

#### Version Information

package-version.txt:

1.0.6-gcc6
------------

## Equivalent System Packages

opensuse:

```
$ sudo zypper install surf
```

See <https://repology.org/project/surf-alggeo/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.318 **surface\_dynamics: dynamics on surfaces (measured foliations, interval exchange transformation, Teichmüller flow, etc)**

#### Description

Dynamics on surfaces.

#### License

GPLv2+

#### Upstream Contact

[https://gitlab.com/videlec/surface\\_dynamics](https://gitlab.com/videlec/surface_dynamics) <https://pypi.org/project/surface-dynamics/>

#### Type

optional

#### Version Information

requirements.txt:

```
surface_dynamics
```

## Equivalent System Packages

See <https://repology.org/project/python:surface-dynamics/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.319 symengine: A C++ symbolic manipulation library

#### Description

SymEngine is a standalone fast C++ symbolic manipulation library.

#### License

BSD 3-clause

#### Upstream Contact

<https://github.com/symengine/symengine>

#### Type

optional

#### Version Information

package-version.txt:

```
0.8.1
```

#### Equivalent System Packages

conda:

```
$ conda install symengine
```

freebsd:

```
$ sudo pkg install math/symengine
```

gentoo:

```
$ sudo emerge sci-libs/symengine
```

macports: install the following packages: symengine nix:

```
$ nix-env --install symengine
```

opensuse:

```
$ sudo zypper install symengine
```

See <https://repology.org/project/symengine/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>



### 4.1.320 symengine\_py: Python wrappers for SymEngine

#### Description

Python wrappers for SymEngine

#### License

symengine.py is MIT licensed and uses several LGPL, BSD-3 and MIT licensed libraries

#### Upstream Contact

<https://github.com/symengine/symengine.py>

#### Type

optional

#### Version Information

package-version.txt:

```
0.8.1.p0
```

install-requires.txt:

```
symengine.py >= 0.6.1
```

#### Equivalent System Packages

conda:

```
$ conda install python-symengine
```

See <https://repology.org/project/python:symengine/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.321 symmetrica: Library for representation theory

#### Description

Symmetrica is a Collection of C routines for representation theory.

It is a program developed by Lehrstuhl Mathematik II of the University of Bayreuth. It has routines to handle the following topics:

- ordinary representation theory of the symmetric group and related groups (2/11/04)
- ordinary representation theory of the classical groups

- modular representation theory of the symmetric group
- projective representation theory of the symmetric group
- combinatorics of tableaux
- symmetric functions and polynomials (7/22/04)
- commutative and non commutative Schubert polynomials
- operations of finite groups.
- ordinary representation theory of Hecke algebras of type  $A_n$

For more details check <http://www.algorithm.uni-bayreuth.de/en/research/SYMMETRICA>

Updated package on <https://gitlab.com/sagemath/symmetrlica/-/releases> with changes to modernize the source and the build system.

## License

Public Domain (see the above web site)

## Upstream Contact

- (passed away in 2013) Axel Kohnert - see <http://www.mathe2.uni-bayreuth.de/axel/>

## Type

standard

## Version Information

package-version.txt:

```
3.0.1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S symmetrlica
```

conda:

```
$ conda install symmetrlica
```

Debian/Ubuntu:

```
$ sudo apt-get install libsymmetrlica2-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install symmetrlica-devel
```

freebsd:

```
$ sudo pkg install math/symmetrica
```

gentoo:

```
$ sudo emerge sci-libs/symmetrica
```

nix:

```
$ nix-env --install symmetrica
```

See <https://repology.org/project/symmetrica/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.322 sympow: Computes special values of symmetric power elliptic curve L-functions

#### Description

SYMPOW is a package to compute special values of symmetric power elliptic curve L-functions. It can compute up to about 64 digits of precision.

#### License

- See the file src/COPYING

#### Upstream Contact

SYMPOW does not appear to be maintained any longer. Mark Watkins, the package author, now works at Magma. Previous (possibly still usable) email is [watkins@maths.usyd.edu.au](mailto:watkins@maths.usyd.edu.au)

New upstream: <https://gitlab.com/rezouer/forks/sympow>

#### Dependencies

- GNU patch

#### Special Update/Build Instructions

- Some of the code is very dubious, and it is anyones guess really what the compiler does with it. For example, the following line exists in src/eulerfactors.c:

```
if ((HECKE) && (d==1)) return hecke_good(p,ap,m,v);
```

But since hecke\_good is defined as returning void, it's hard to know exactly how this code behaves. I would not be surprised by any bugs that might show up. I (David Kirkby) would personally not trust this code much at all.

- This is a difficult package to maintain. A trac ticket (#9758) has been opened to implement Watkins-Delaunay's algorithm for computing modular degrees in Sage. Once implemented, it should be possible to remove this package.

- The package is configured such that the data files are in a directory below where ‘sympow’ is installed. If Sage is installed globally, then it will be impossible to create the data files without being root. This has been fixed in the Gentoo Linux distribution. Some information from Christopher can be seen on [http://trac.sagemath.org/sage\\_trac/ticket/9703](http://trac.sagemath.org/sage_trac/ticket/9703) This package will generate binary versions of all shipped datafiles, so these will work. However, creating totally new datafiles from scratch will not work.

### Type

standard

### Version Information

package-version.txt:

```
2.023.6
```

### Equivalent System Packages

arch:

```
$ sudo pacman -S sympow
```

conda:

```
$ conda install sympow
```

Debian/Ubuntu:

```
$ sudo apt-get install sympow
```

Fedora/Redhat/CentOS:

```
$ sudo yum install sympow
```

gentoo:

```
$ sudo emerge sci-mathematics/sympow
```

nix:

```
$ nix-env --install sympow
```

opensuse:

```
$ sudo zypper install sympow
```

See <https://repology.org/project/sympow/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.323 sympy: Python library for symbolic mathematics

#### Description

SymPy is a Python library for symbolic mathematics. It aims to become a full-featured computer algebra system (CAS) while keeping the code as simple as possible in order to be comprehensible and easily extensible. SymPy is written entirely in Python and does not require any external libraries, except optionally for plotting support.

#### Website

<https://sympy.org/>

#### License

New BSD: <http://www.opensource.org/licenses/bsd-license.php>

#### Upstream Contact

sympy mailinglist: <http://groups.google.com/group/sympy>

#### Dependencies

- Python 2.5 or later

#### Special Update/Build Instructions

- A simple script can be used to ease the updating of the SPKG. See the README.

#### Type

standard

#### Version Information

package-version.txt:

1.9
-----

install-requires.txt:

sympy >=1.6, <2.0
-------------------

## Equivalent System Packages

conda:

```
$ conda install sympy
```

macports: install the following packages: py-sympy See <https://repology.org/project/python:sympy/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.324 tachyon: A ray tracing system

#### Description

Tachyon is a raytracer developed by John E. Stone. Tachyon supports the typical ray tracer features, most of the common geometric primitives, shading and texturing modes, etc. It also supports less common features such as HDR image output, ambient occlusion lighting, and support for various triangle mesh and volumetric texture formats beneficial for molecular visualization (e.g. rendering VMD scenes).

Currently not all of Tachyon's functionality is exported by the Sage interface.

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#### Upstream Contact

- <http://jedi.ks.uiuc.edu/~johns/raytracer/>
- <http://www.photonlimited.com/~johns/raytracer/>
- John Stone <[johns@ks.uiuc.edu](mailto:johns@ks.uiuc.edu)>

## Dependencies

This spkg depends on:

- libpng

## Special Update/Build Instructions

- Delete the scenes directory, which has lots of cool examples.
- Delete the msvc directory, which is also large and not used within Sage.
- The CVS subdirectories are currently (almost) empty, but should otherwise be deleted.
- The upstream files had strange permissions, i.e. some source files were executable, while almost all files weren't world-readable.
- There's seems to be some crap like `tachyon.html.tar.gz` and a few `.#*` files I haven't [yet] deleted, since they're not that large.
- TODO: Check whether building multi-threaded versions on MacOS X meanwhile works. (This was said to fail with an old beta.)
- TODO: Use `patch` instead of copying over pre-patched files.
- TODO: [Optionally] also install some of the documentation.
- TODO: I doubt the CFLAGS set for AIX and HP-UX won't get overridden by the created Makefile, but that's a minor issue. -leif

## Type

standard

## Version Information

package-version.txt:

```
0.98.9.p7
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S tachyon
```

conda:

```
$ conda install tachyon
```

Debian/Ubuntu:

```
$ sudo apt-get install tachyon
```

Fedora/Redhat/CentOS:

```
$ sudo yum install tachyon tachyon-devel
```

freebsd:

```
$ sudo pkg install graphics/tachyon
```

gentoo:

```
$ sudo emerge media-gfx/tachyon
```

nix:

```
$ nix-env --install tachyon
```

opensuse:

```
$ sudo zypper install tachyon
```

See <https://repology.org/project/tachyon/versions>, <https://repology.org/project/tachyon-opengl/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.325 tdlb: Algorithms for computing tree decompositions

#### Description

Providing algorithms concerning treedecompositions

website: <https://github.com/freetdi/tdlib>

#### License

GNU General Public License v2

#### SPKG Maintainers

Lukas Larisch ([lukas.larisch@kaust.edu.sa](mailto:lukas.larisch@kaust.edu.sa))

#### Upstream Contact

- Lukas Larisch ([lukas.larisch@kaust.edu.sa](mailto:lukas.larisch@kaust.edu.sa))
- git-repo: <https://github.com/freetdi/tdlib>



## Dependencies

- None

## Type

optional

## Version Information

package-version.txt:

```
0.3.1.p0
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S tdlb
```

See <https://repology.org/project/python:tdlib/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.326 terminado: Tornado websocket backend for the term.js Javascript terminal emulator library

### Description

This is a Tornado websocket backend for the term.js Javascript terminal emulator library.

It evolved out of pyxterm, which was part of GraphTerm (as lineterm.py), v0.57.0 (2014-07-18), and ultimately derived from the public-domain Ajaxterm code, v0.11 (2008-11-13) (also on Github as part of QWeb).

## Type

standard

## Version Information

package-version.txt:

```
0.12.1
```

install-requires.txt:

```
terminado >=0.8.3
```

## Equivalent System Packages

conda:

```
$ conda install terminado
```

macports: install the following packages: py-terminado See <https://repology.org/project/terminado/versions>, <https://repology.org/project/python:terminado/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.327 testpath: Testing utilities for filesystem-related code

#### Description

Testpath is a collection of utilities for testing code which uses and manipulates the filesystem and system commands

#### Type

standard

#### Version Information

package-version.txt:

```
0.5.0
```

install-requires.txt:

```
testpath >=0.4.4
```

## Equivalent System Packages

conda:

```
$ conda install testpath
```

macports: install the following packages: py-testpath See <https://repology.org/project/testpath/versions>, <https://repology.org/project/python:testpath/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.328 texlive: A comprehensive TeX system

#### Description

TeX Live is an easy way to get up and running with the TeX document production system. It provides a comprehensive TeX system with binaries for most flavors of Unix, including GNU/Linux, and also Windows. It includes all the major TeX-related programs, macro packages, and fonts that are free software, including support for many languages around the world.

This package installs all texlive packages required to build Sage. If necessary, texlive itself is installed.

#### License

Various FSF-approved free software licenses. See <https://www.tug.org/texlive/copying.html> for details.

#### Upstream Contact

Home page: <https://www.tug.org/texlive>

#### Dependencies

- python

#### Special Update/Build Instructions

This package requires internet access to download texlive packages for the TeX mirrors.

#### Type

optional

#### Version Information

#### Equivalent System Packages

macports: install the following packages: texlive See <https://repology.org/project/texlive/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

### 4.1.329 texttable: Python module for creating simple ASCII tables

#### Description

Python module for creating simple ASCII tables

## License

MIT License (MIT)

## Upstream Contact

<https://github.com/foutaise/texttable/>

## Dependencies

- python

## Special Update/Build Instructions

### Type

optional

### Version Information

package-version.txt:

1.6.3

install-requires.txt:

texttable >=1.6.3

## Equivalent System Packages

macports: install the following packages: py-texttable See <https://repology.org/project/texttable/versions>, <https://repology.org/project/python:texttable/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.330 thebe: Add live Jupyter interaction to static websites

### Description

Jupyter javascript plugin for static sites. Thebe takes the Jupyter front end, and make it work outside of the notebook context.

This is used by Sage's Sphinx-based documentation build system to produce html documentation that can be turned live (see <https://trac.sagemath.org/ticket/20690>).

**License**

MIT

**Upstream Contact**

- Home page: <https://oreillymedia.github.io/thebe/>
- Source: <https://github.com/oreillymedia/thebe/>

**Dependencies**

None.

**Special Update/Build Instructions**

There are no release numbers, hence find the latest commit, download <https://github.com/oreillymedia/thebe/archive/\protect\T1\textdollar%7BCOMMIT%7D.zip> and rename it `thebe-${COMMIT:0:8}.zip`

**Type**

standard

**Version Information**

package-version.txt:

9624e0a0.p0
-------------

**Equivalent System Packages**

See <https://repology.org/project/thebe/versions>

However, these system packages will not be used for building Sage because `spkg-configure.m4` has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

**4.1.331 threejs: JavaScript library to display 3D graphics in the browser****Description**

Three.js is a JavaScript library to display 3D graphics in the browser.

## License

MIT License

## Upstream Contact

Home page: <http://threejs.org>

## Dependencies

None.

## Special Update/Build Instructions

None.

## Type

standard

## Version Information

package-version.txt:

```
r122.p0
```

## Equivalent System Packages

conda:

```
$ conda install three.js
```

See <https://repology.org/project/threejs/versions>, <https://repology.org/project/threejs-sage/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.332 tides: Integration of ODEs

### Description

TIDES is a library for integration of ODEs with high precision.

## License

GPLv3+

## Upstream Contact

- Marcos Rodriguez ([marcos@unizar.es](mailto:marcos@unizar.es))

## Dependencies

- gcc
- mpfr
- gmp

## Special Update/Build Instructions

minc\_tides.patch changes the size of the name of the temporal files, so there is no problem in systems that use long names. Also solves a bug in the inverse function.

## Type

optional

## Version Information

package-version.txt:

2.0.p0
--------

## Equivalent System Packages

See <https://repology.org/project/tides/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.333 toml: Python Library for Tom's Obvious, Minimal Language

### Description

Python Library for Tom's Obvious, Minimal Language

## License

MIT

## Upstream Contact

<https://pypi.org/project/toml/>

## Type

standard

## Version Information

package-version.txt:

0.10.2
--------

install-requires.txt:

toml
------

## Equivalent System Packages

If the system package is installed, ./configure will check whether it can be used.

### 4.1.334 tomli: A lil' TOML parser

## Description

A lil' TOML parser

## License

## Upstream Contact

<https://pypi.org/project/tomli/>

## Type

standard



## Version Information

package-version.txt:

```
1.2.1
```

install-requires.txt:

```
tomli
```

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.335 topcom: Compute triangulations of point configurations and oriented matroids

#### Description

TOPCOM is a collection of clients to compute Triangulations Of Point Configurations and Oriented Matroids, resp.

The algorithms use only combinatorial data of the point configuration as is given by its oriented matroid. Some basic commands for computing and manipulating oriented matroids can also be accessed by the user.

It was very much inspired by the maple program PUNTOS, which was written by Jesus de Loera. TOPCOM is entirely written in C++, so there is a significant speed up compared to PUNTOS.

#### License

GPL v2

#### Upstream Contact

```
Prof. Dr. Jörg Rambau <Joerg.Rambau@uni-bayreuth.de>
Lehrstuhl für Wirtschaftsmathematik
Raum FAN-D.1.29 (Sekretariat: FAN-D.1.30)
Universität Bayreuth
D-95440 Bayreuth
Germany
Tel: +49-921-55-7350, Fax: +49-921-55-7352
http://www.rambau.wm.uni-bayreuth.de
```

## Dependencies

- gmp, libcdd

## Special Update/Build Instructions

See spkg-src

## Type

optional

## Version Information

package-version.txt:

0.17.7
--------

## Equivalent System Packages

See <https://repology.org/project/topcom/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.336 tornado: Python web framework and asynchronous networking library

### Description

Python web framework and asynchronous networking library

### License

Apache License

### Upstream Contact

Home page: <http://www.tornadoweb.org>

## Dependencies

Python

## Type

standard

## Version Information

package-version.txt:

```
6.1
```

install-requires.txt:

```
tornado >=6.0.4
```

## Equivalent System Packages

conda:

```
$ conda install tornado
```

macports: install the following packages: py-tornado opensuse:

```
$ sudo zypper install python3-tornado
```

See <https://repology.org/project/python:tornado/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.337 tox: tox is a generic virtualenv management and test command line tool

### Description

tox is a generic virtualenv management and test command line tool

### License

MIT

## Upstream Contact

<https://pypi.org/project/tox/>

## Type

standard

## Version Information

package-version.txt:

```
3.24.3
```

install-requires.txt:

```
tox
```

## Equivalent System Packages

conda:

```
$ conda install tox
```

cygwin:

```
$ apt-cyg install tox
```

Debian/Ubuntu:

```
$ sudo apt-get install tox
```

Fedora/Redhat/CentOS:

```
$ sudo yum install tox
```

freebsd:

```
$ sudo pkg install tox
```

gentoo:

```
$ sudo emerge tox
```

homebrew:

```
$ brew install tox
```

macports: install the following packages: py-tox slackware:

```
$ sudo slackpkg install tox
```

void:

```
$ sudo xbps-install tox
```

See <https://repology.org/project/python:tox/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.338 traitlets: Traitlets Python configuration system

#### Description

Traitlets Python configuration system

#### License

BSD

#### Upstream Contact

<https://pypi.org/project/traitlets/>

#### Type

standard

#### Version Information

package-version.txt:

```
5.1.1
```

install-requires.txt:

```
traitlets >=4.3.3
```

#### Equivalent System Packages

conda:

```
$ conda install traitlets
```

macports: install the following packages: py-traitlets opensuse:

```
$ sudo zypper install python3-traitlets
```

See <https://repology.org/project/traitlets/versions>, <https://repology.org/project/python:traitlets/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.339 `typing_extensions`: Backported and Experimental Type Hints for Python 3.5+

#### Description

Backported and Experimental Type Hints for Python 3.5+

#### License

PSF

#### Upstream Contact

<https://pypi.org/project/typing-extensions/>

#### Type

standard

#### Version Information

package-version.txt:

3.10.0.0
----------

install-requires.txt:

typing-extensions
-------------------

#### Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

### 4.1.340 `tzlocal`: Python timezone information for the local timezone

#### Description

tzinfo object for the local timezone

**Type**

standard

**Version Information**

package-version.txt:

```
2.1
```

install-requires.txt:

```
tzlocal >=2.1
```

**Equivalent System Packages**

conda:

```
$ conda install tzlocal
```

macports: install the following packages: py-tzlocal opensuse:

```
$ sudo zypper install python3-tzlocal
```

See <https://repology.org/project/tzlocal/versions>, <https://repology.org/project/python:tzlocal/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

**4.1.341 urllib3: HTTP library with thread-safe connection pooling, file post, and more.****Description**

HTTP library with thread-safe connection pooling, file post, and more.

**License**

MIT

**Upstream Contact**

<https://pypi.org/project/urllib3/>

## Type

standard

## Version Information

package-version.txt:

1.26.6
--------

install-requires.txt:

urllib3
---------

## Equivalent System Packages

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.342 valgrind: Memory error detector, call graph generator, runtime profiler

### Description

This is an optional spkg. It supports Linux on x86, x86-64, ppc, ppc64 and ARM as well as Darwin (Mac OS X 10.5 and 10.6) on x86 and x86-64.

Valgrind is an instrumentation framework for building dynamic analysis tools. There are Valgrind tools that can automatically detect many memory management and threading bugs, and profile your programs in detail. You can also use Valgrind to build new tools.

The Valgrind distribution currently includes six production-quality tools: a memory error detector, two thread error detectors, a cache and branch-prediction profiler, a call-graph generating cache and branch-prediction profiler, and a heap profiler. It also includes three experimental tools: a heap/stack/global array overrun detector, a second heap profiler that examines how heap blocks are used, and a SimPoint basic block vector generator. It runs on the following platforms: X86/Linux, AMD64/Linux, ARM/Linux, PPC32/Linux, PPC64/Linux, S390X/Linux, ARM/Android (2.3.x), X86/Darwin and AMD64/Darwin (Mac OS X 10.6 and 10.7).

### License

Valgrind is Open Source / Free Software, and is freely available under the GNU General Public License, version 2.

### Upstream Contact

- <http://www.valgrind.org/>
- valgrind-user, valgrind-devel mailing lists



## Dependencies

- None

## Special Build Instructions

- To build on OS X, you need to use Apple's compiler. FSF GCC is unsupported.

## Patches

- None.

## Type

experimental

## Version Information

package-version.txt:

```
3.14.0
```

## Equivalent System Packages

homebrew:

```
$ brew install valgrind
```

macports: install the following packages: valgrind opensuse:

```
$ sudo zypper install valgrind
```

See <https://repology.org/project/valgrind/versions>

However, these system packages will not be used for building Sage because spkg-configure.m4 has not been written for this package; see <https://trac.sagemath.org/ticket/27330>

## 4.1.343 vcversioner: Python build system extension to obtain package version from version control

### Description

Write a setup.py with no version information specified, and vcversioner will find a recent, properly-formatted VCS tag and extract a version from it.

## License

Python Software Foundation License

## Upstream Contact

Home page: <https://pypi.python.org/pypi/vcversioner/>

## Dependencies

Python, Setuptools

## Type

standard

## Version Information

package-version.txt:

```
2.16.0.0.p0
```

install-requires.txt:

```
vcversioner >=2.16.0.0
```

## Equivalent System Packages

conda:

```
$ conda install vcversioner
```

macports: install the following packages: py-vcversioner opensuse:

```
$ sudo zypper install python3-vcversioner
```

See <https://repology.org/project/vcversioner/versions>, <https://repology.org/project/python:vcversioner/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.344 virtualenv: Virtual Python Environment builder

### Description

Virtual Python Environment builder

## License

MIT

## Upstream Contact

<https://pypi.org/project/virtualenv/>

## Type

standard

## Version Information

package-version.txt:

20.7.2
--------

install-requires.txt:

virtualenv
------------

## Equivalent System Packages

If the system package is installed, ./configure will check whether it can be used.

## 4.1.345 wcwidth: Measures the displayed width of unicode strings in a terminal

### Description

Measures the displayed width of unicode strings in a terminal

### License

MIT

### Upstream Contact

<https://pypi.org/project/wcwidth/>

## Type

standard

## Version Information

package-version.txt:

```
0.2.5
```

install-requires.txt:

```
wcwidth >=0.1.7
```

## Equivalent System Packages

conda:

```
$ conda install wcwidth
```

macports: install the following packages: py-wcwidth opensuse:

```
$ sudo zypper install python3-wcwidth
```

See <https://repology.org/project/wcwidth/versions>, <https://repology.org/project/python:wcwidth/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.346 webencodings: Character encoding aliases for legacy web content

### Description

Character encoding aliases for legacy web content.

### License

BSD License

### Upstream Contact

Home Page: <https://github.com/gsnedders/python-webencodings>

## Dependencies

Python

## Type

standard

## Version Information

package-version.txt:

```
0.5.1
```

install-requires.txt:

```
webencodings >=0.5.1
```

## Equivalent System Packages

conda:

```
$ conda install webencodings
```

macports: install the following packages: py-webencodings opensuse:

```
$ sudo zypper install python3-webencodings
```

See <https://repology.org/project/python:webencodings/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.347 wheel: A built-package format for Python

### Description

A built-package format for Python

### License

MIT

## Upstream Contact

<https://pypi.org/project/wheel/>

## Type

standard

## Version Information

package-version.txt:

```
0.37.0
```

install-requires.txt:

```
# https://trac.sagemath.org/ticket/31050 - version constraint for macOS Big Sur support
wheel >=0.36.2
```

## Equivalent System Packages

conda:

```
$ conda install wheel
```

macports: install the following packages: py-wheel opensuse:

```
$ sudo zypper install python3-wheel
```

See <https://repology.org/project/wheel/versions>, <https://repology.org/project/python:wheel/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.348 widgetsnbextension: Jupyter notebook extension for interactive HTML widgets

### Description

Interactive HTML widgets for Jupyter notebooks.

### Type

standard

## Version Information

package-version.txt:

```
3.5.2
```

install-requires.txt:

```
widgetsnbextension >=3.5.1
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S jupyter-widgetsnbextension
```

conda:

```
$ conda install widgetsnbextension
```

Fedora/Redhat/CentOS:

```
$ sudo yum install python-widgetsnbextension
```

freebsd:

```
$ sudo pkg install devel/py-widgetsnbextension
```

gentoo:

```
$ sudo emerge dev-python/widgetsnbextension
```

macports: install the following packages: py-widgetsnbextension opensuse:

```
$ sudo zypper install jupyter-widgetsnbextension
```

void:

```
$ sudo xbps-install python3-jupyter_widgetsnbextension
```

See <https://repology.org/project/python:widgetsnbextension/versions>, <https://repology.org/project/jupyter-widgetsnbextension/versions>, <https://repology.org/project/python:jupyter-widgetsnbextension/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.349 xz: General-purpose data compression software

### Description

XZ Utils is free general-purpose data compression software with a high compression ratio.

### License

Some parts public domain, other parts GNU LGPLv2.1, GNU GPLv2, or GNU GPLv3.

### Upstream Contact

<http://tukaani.org/xz/>

### Dependencies

#### Type

standard

### Version Information

package-version.txt:

```
5.2.5
```

### Equivalent System Packages

conda:

```
$ conda install xz
```

cygwin:

```
$ apt-cyg install xz
```

Debian/Ubuntu:

```
$ sudo apt-get install xz-utils
```

Fedora/Redhat/CentOS:

```
$ sudo yum install xz
```

homebrew:

```
$ brew install xz
```

macports: install the following packages: xz opensuse:



```
$ sudo zypper install xz
```

slackware:

```
$ sudo slackpkg install xz
```

void:

```
$ sudo xbps-install xz
```

See <https://repology.org/project/xz/versions>

If the system package is installed, ./configure will check whether it can be used.

## 4.1.350 zeromq: A modern networking library

### Description

A modern networking library. Also known as 0mq or zmq. The same API is provided by <http://www.crossroads.io>, though we currently use the <http://www.zeromq.org> implementation.

### License

LGPLv3+

### Upstream Contact

<http://www.zeromq.org>

### Dependencies

A working compiler.

### Special Update/Build Instructions

N/A

### Type

standard

## Version Information

package-version.txt:

```
4.3.4
```

## Equivalent System Packages

conda:

```
$ conda install zeromq
```

cygwin:

```
$ apt-cyg install libzmq-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libzmq3-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install zeromq zeromq-devel
```

freebsd:

```
$ sudo pkg install net/libzmq4
```

homebrew:

```
$ brew install zeromq
```

macports: install the following packages: zmq-devel opensuse:

```
$ sudo zypper install "pkgconfig(libzmq)"
```

void:

```
$ sudo xbps-install zeromq-devel
```

See <https://repology.org/project/zeromq/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.351 zipp: A pathlib-compatible zipfile object wrapper

#### Description

A pathlib-compatible Zipfile object wrapper. A backport of the Path object.

## License

MIT License

## Upstream Contact

Home page: <https://github.com/jaraco/zip>

## Dependencies

Python, Setuptools

## Type

standard

## Version Information

package-version.txt:

```
3.5.0
```

install-requires.txt:

```
zip >=0.5.2
```

## Equivalent System Packages

conda:

```
$ conda install zip
```

macports: install the following packages: py-zip See <https://repology.org/project/python:zip/versions>

However, these system packages will not be used for building Sage because using Python site-packages is not supported by the Sage distribution; see <https://trac.sagemath.org/ticket/29023>

## 4.1.352 zlib: Data compression library

### Description

Massively Spiffy Yet Delicately Unobtrusive Compression Library (Also Free, Not to Mention Unencumbered by Patents)

## License

- Modified BSD.

## Upstream Contact

- <http://www.zlib.net/>

## Dependencies

- None

## Special Update/Build Instructions

## Patches

- cygwin\_symbols.patch: remove undefined symbols on Cygwin.

## Type

standard

## Version Information

package-version.txt:

```
1.2.11.p0
```

## Equivalent System Packages

conda:

```
$ conda install zlib
```

cygwin:

```
$ apt-cyg install zlib-devel
```

Debian/Ubuntu:

```
$ sudo apt-get install libz-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install zlib-devel
```

homebrew:

```
$ brew install zlib
```

macports: install the following packages: zlib opensuse:

```
$ sudo zypper install "pkgconfig(zlib)"
```

slackware:

```
$ sudo slackpkg install zlib
```

void:

```
$ sudo xbps-install  zlib-devel
```

See <https://repology.org/project/zlib/versions>

If the system package is installed, ./configure will check whether it can be used.

### 4.1.353 zn\_poly: C library for polynomial arithmetic in $\mathbb{Z}/n\mathbb{Z}[x]$

#### Description

zn\_poly is a C library for polynomial arithmetic in  $\mathbb{Z}/n\mathbb{Z}[x]$ , where  $n$  is any modulus that fits into an unsigned long.

Website: [https://gitlab.com/sagemath/zn\\_poly](https://gitlab.com/sagemath/zn_poly)

Note: Original website is at [https://web.maths.unsw.edu.au/~davidharvey/code/zn\\_poly/](https://web.maths.unsw.edu.au/~davidharvey/code/zn_poly/) but is no longer maintained. Sage maintains an “official” continuation of the project at the above link.

#### License

GPL V2 or V3. Some of the code has been copied from other projects - see the file src/COPYING for details.

#### Upstream Contact

- David Harvey
- E. M. Bray <[erik.m.bray@gmail.com](mailto:erik.m.bray@gmail.com)>

#### Dependencies

- GMP/MPPIR
- (some) Python (to create the Makefile)
- GNU patch
- NTL apparently only if we configured zn\_poly differently (same for FLINT)

## Special Update/Build Instructions

- Make sure the patches still apply.  
Especially changes in `makemakefile.py` may also require changes to `spkg-install` (and perhaps also `spkg-check`).
- There's also a `--use-flint` option to `configure`; no idea what it does, and we currently don't use it either.
- TODO:
- Use `make install` instead of manually “installing” (copying and symlinking) the [shared] libraries and header files. This requires further tweaking of `makemakefile.py`, since it currently only installs a static library and the headers.
- If everything's fine, i.e., no problems arise, some comments and especially some code I currently just commented out can certainly be removed. (-leif, 04/2012)
- The version number “0.9.p11” is used as a doctest in the function `package_versions` in `sage/misc/packages.py`, so if this package gets upgraded, that doctest needs to be changed.

## Patches

- All patches from Sage have been merged into upstream. These include:
- `makemakefile.py.patch`:  
Improves the Python script creating the Makefile for better use at least within Sage; see patch for details. (Last modified at #12433, which added and changed a lot.)
- `profiler.c.patch`, `zn_poly.h.patch`:  
Fix potential redefinition of `ulong` (in combination with other headers).
- `mpn_mulmid-tune.c.patch`, `mulmid-tune.c.patch`, `mul-tune.c.patch`:  
Fix “jump into scope of identifier with variably modified type” errors. (See #8771).
- `mpn_mulmid-test.c.patch`:  
Fix a potential problem when the value of `ZNP_mpn_smp_kara_thresh` is `SIZE_MAX`, this is usually unrealistic but can happen at least on linux on power7 with gcc-4.7.1 (see #14098).
- `fix_fudge_factor_in_nuss-test.c.patch`:  
As the name says; fix provided by upstream (David Harvey); see #13947.

## Type

standard

## Version Information

package-version.txt:

```
0.9.2
```

## Equivalent System Packages

arch:

```
$ sudo pacman -S zn_poly
```

conda:

```
$ conda install zn_poly
```

Debian/Ubuntu:

```
$ sudo apt-get install libzn-poly-dev
```

Fedora/Redhat/CentOS:

```
$ sudo yum install zn_poly zn_poly-devel
```

freebsd:

```
$ sudo pkg install math/zn_poly
```

nix:

```
$ nix-env --install zn_poly
```

opensuse:

```
$ sudo zypper install zn_poly-devel
```

See <https://repology.org/project/zn-poly/versions>, <https://repology.org/project/libzn-poly/versions>

If the system package is installed, ./configure will check whether it can be used.