

Introduction to SageMath

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SageMath

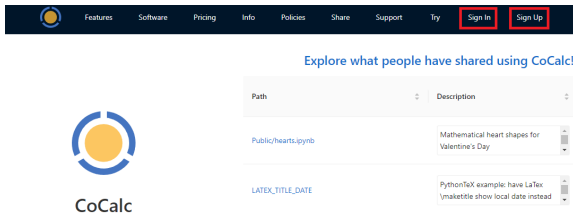
SageMath is a free open-source mathematics software system. It builds on top of many existing open-source packages: NumPy, matplotlib, R and many more. Access their combined power through a common, Python-based language.

The screenshot shows the SageMath website homepage. At the top left is the SageMath logo. To the right are links for 'Blog - Trac - Wiki - Questions?' and 'Sponsor - Donate'. Below these are 'Online: CoCalc - SageCell or Install, Clone' and social media icons for Facebook, Twitter, and a 'Language' dropdown menu. A navigation bar contains 'Home', 'Tour', 'Help', 'Library', 'Download', 'Development', and 'Links'. The main content area starts with a paragraph describing SageMath as a free open-source mathematics software system licensed under the GPL, built on top of many existing open-source packages like NumPy, SciPy, matplotlib, Sympy, Maxima, GAP, FLINT, R, and many more. It mentions that users can access their combined power through a common, Python-based language or directly via interfaces or wrappers. Below this is a mission statement: 'Mission: Creating a viable free open source alternative to Magma, Maple, Mathematica and Matlab.' A section titled 'Learn how to use SageMath:' lists resources: 'Sage for Undergraduates by Gregory Bard (Spanish: Sage para Estudiantes de Pregrado)', 'Mathematical Computation with Sage by Paul Zimmermann et al.', and '(French: Calcul mathématique avec Sage, German: Rechnen mit Sage)'. At the bottom, a red box highlights two buttons: 'CoCalc Instant SageWorksheet' with a circular icon and 'or: SageMathCell', and 'Install 9.6' with a downward arrow icon. The 'Install 9.6' button also includes links for 'Release Tours - Changelogs - Source tarball 9.6 - Clone from GitHub'.

- The circular icon on the left opens online worksheets.
- The arrow icon on the right links to download pages.

SageMath – Online

Create an account or sign in from the upper right corner.



The screenshot shows the top navigation bar of the SageMath website. The navigation items are: Home (logo), Features, Software, Pricing, Info, Policies, Share, Support, Try, Sign In, and Sign Up. The 'Sign In' and 'Sign Up' buttons are highlighted with red boxes. Below the navigation bar, there is a section titled 'Explore what people have shared using CoCalc!'. On the left, there is the CoCalc logo (a blue circle with a yellow center) and the text 'CoCalc'. On the right, there is a table with two columns: 'Path' and 'Description'. The table contains two rows of data:

Path	Description
Public/hearts.pytb	Mathematical heart shapes for Valentine's Day
LATEX_TITLE_DATE	PythonTeX example: have LaTeX \maketitle show local date instead

- Sign up to create a new user account.
- Sign in if you already have one.

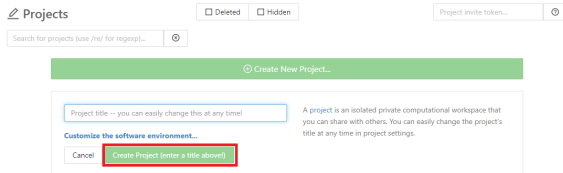


The screenshot shows the top navigation bar of the SageMath website after signing in. The navigation items are: Home (logo), Projects, Features, Software, Pricing, Info, Policies, Share, Support, and Account (with a dropdown arrow). The 'Projects' button is highlighted with a red box. Below the navigation bar, there is a section titled 'Signed in as Su, Yu-Cheng'. Below this, there is a row of navigation items: Projects, Features, Software, Pricing, Config, Store, Licenses, Billing, Share, Support, Status, and Docs.

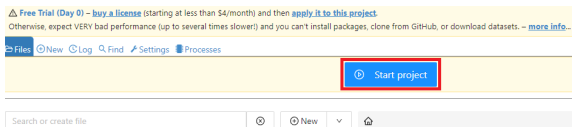
Click the project bottom after signed in.

SageMath – Online

Start a new project and a new worksheet.



On the top of the window is an optional choice to buy a license, it is fine ignoring it and just start your project.



Loading...

SageMath – Online

There are no worksheets, create one.

No files found

+ Create or Upload Files...

I personally recommend the Jupyter notebook, which has a more friendly interface.

The screenshot shows a dialog box titled "Create new file or directory" with a close button (X) in the top right corner. Below the title bar is a home icon. The main content area contains a text input field with the placeholder "Name your file, folder, or paste in a link. End filename with / to make a folder." and a search icon. To the right of the input field are two buttons: "Create file with no extension" and "More file types..." with a dropdown arrow. Below the input field is a section titled "What would you like to create? All documents can be simultaneously edited in realtime with your collaborators." This section contains a grid of buttons for different file types: "Jupyter Notebook" (highlighted with a red box), "Linux Terminal", "Whiteboard", "Markdown Document", "Sage Worksheet", "LaTeX Document", "Linux Graphical X11 desktop", and "Create a folder". Below this grid are two more buttons: "Create a chatroom" and "Manage a course". Further down are three buttons: "RMarkdown", "Todo list", and "Stopwatches and Timers". At the bottom of the dialog is a button labeled "Download from Internet (access blocked -- see project settings)". At the very bottom of the dialog are four buttons: "Jupyter Classic Server...", "JupyterLab Server...", "VS Code Server...", and "Pluto server...".

SageMath – Online

There are several kernel can be applied, we pick SageMath 9.6.

Select a Kernel

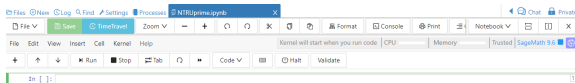
This notebook has no kernel.

A working kernel is required in order to evaluate the code in the notebook. Please select one for the programming language you want to work with.

Suggested kernels

Julia 1.7	The Julia Programming Language
Python 3 (system-wide)	Python 3 programming language
R (system-wide)	R statistical programming language
SageMath 9.6	Open-source mathematical software system

Finally, the worksheet is ready to use.



SageMath – Offline

Please follow the guide for your operating system, download the files and install.

Sage 9.6 Documentation » Installation Guide » Welcome to the Sage Installation Guide!

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- Welcome to the Sage Installation Guide
- macOS
- Windows
- Linux
- In the cloud

Next topic

Linux package managers

Welcome to the Sage Installation Guide!

If you are reading this manual at <https://doc.sagemath.org/>, note that it was built at the time the most recent stable release of SageMath was made.

More up-to-date information and details regarding supported platforms may have become available afterwards and can be found in the section "Availability and installation help" of the [release tour](#) for each SageMath release.

Where would you like to run SageMath? Pick one of the following sections.

- For Windows, the last installer is version 9.3.
- Version 9.4 and later all use Windows Subsystem for Linux (WSL) or Cygwin.

SageMath – Offline

There are 2 solutions for Windows users.

- 1 The version 9.3 installer link:
<https://github.com/sagemath/sage-windows/releases>.
- 2 For the up-to-date versions, install Windows Subsystem for Linux (WSL) or Cygwin first.
 - Official document for installing WSL:
<https://docs.microsoft.com/en-us/windows/wsl/install>
 - Home of the Cygwin project: <https://cygwin.com/>

SageMath – Offline

- With WSL installed, follow the instruction for Linux.
- For the Cygwin, follow the commands.

Cygwin prerequisite installation

Sage can be built only on the 64-bit version of Cygwin. See the file [README.md](#) in `SAGE_ROOT` for the most up-to-date instructions for building Sage on Cygwin.

Although it is possible to install Sage's dependencies using the Cygwin graphical installer, it is recommended to install the `apt-cyg` command-line package installer, which is used for the remainder of these instructions. To run `apt-cyg`, you must have already installed (using the graphical installer) the following packages at a minimum:

```
bzip2 coreutils gawk gzip tar wget
```

With the exception of `wget` most of these are included in the default package selection when you install Cygwin. Then, to install `apt-cyg` run:

```
$ curl -OL https://rawgit.com/transcode-open/apt-cyg/master/apt-cyg
$ install apt-cyg /usr/local/bin
$ rm -f apt-cyg
```

To install the current set of system packages known to work for building Sage, run:

```
$ apt-cyg install R binutils bzip2 cddlib-devel cddlib-tools cmake curl findutils gcc-core gcc-fortran gcc-g+
< |>
```

Optional packages that are also known to be installable via system packages include:

```
$ apt-cyg install clang graphviz info lib4t12-devel lib4t12_0 libisl-devel libxml2-devel ninja perl-Term-Read
< |>
```

SageMath – Offline

On Debian GNU/Linux version ≥ 11 , Ubuntu version ≥ 21.04 , and Arch Linux, there are three packages to install:

- sagemath (for the binaries)
- sagemath-jupyter (for the browser interface)
- and the documentation
 - sagemath-doc-en (Debian/Ubuntu)
 - sagemath-doc (Arch Linux)

SageMath – Offline

For macOS, download the dmg file from
https://github.com/3-manifolds/Sage_macOS/releases



▼ Assets 6		
 hashes_arm64.json	170 Bytes	8 days ago
 hashes_x86_64.json	171 Bytes	8 days ago
 SageMath-9.6_arm64.dmg	900 MB	8 days ago
 SageMath-9.6_x86_64.dmg	993 MB	8 days ago
 Source code (zip)		9 days ago
 Source code (tar.gz)		9 days ago

References

- SageMath official webpage: <https://www.sagemath.org/>
- Official WSL setup guide:
<https://docs.microsoft.com/en-us/windows/wsl/install>
- Home of the Cygwin project: <https://cygwin.com/>
- Windows GitHub releases page (out-of-date):
<https://github.com/sagemath/sage-windows/releases>