

BRIEF ARTICLE

THE AUTHOR

1. SETUP

Go to <https://www.sagemath.org/download.html>, pick a repository, choose the Apple Mac OS X version and download the latest version on the list whose name ends with `.app.dmg`. Open the `.dmg` file and copy the `SageMath-x.x.app` (where `x.x` is the version number of Sage) to your Desktop. Rename `SageMath-x.x.app` to `SageMath.app` and move it into `/Applications`. Make a symbolic link of the sage executable in `/usr/local/bin` (note the final period, it's important):

```
cd /usr/local/bin
sudo ln -s /Applications/SageMath.app/Contents/Resources/sage/sage .
```

If you are running macOS Catalina (10.15.x) or later, add `SageMath.app` to the Full Disk Access list under the Privacy tab in the Security & Privacy pane of System Preferences. Then Double-Click the `SageMath.app` to open it for the first time. If you get a rather ominous sounding message¹ that doesn't allow you to Open the application you need to Ctl-Click (or Right-Click) the application and use the Open option in the resulting Contextual Menu which will produce another message that does have an Open button.

Finally make sure sage is expanded by running

```
cd
sage --version
```

which *may* generate quite a few lines of output and finally end with a line giving the version number of the sage you are running.

Next create a `sagetex` folder in `/usr/local/texlive/texmf-local/tex/latex` and make a symbolic link of `sagetex.sty` in that folder (again, notice the line with a final period):

```
cd /usr/local/texlive/texmf-local/tex/latex
sudo mkdir sagetex
cd sagetex
sudo ln -s \
    /Applications/SageMath.app/Contents/Resources/sage/local/share/texmf/tex/latex/sagetex/sagetex.sty .
sudo mktexlsr
```

to allow \TeX to use the `sagetex` package.

When the SageMath application is updated copy it to your Desktop, rename it `SageMath.app` as noted above and then drag and drop it onto the Applications folder, simply replacing the version

¹This is because the application isn't signed.

already there. There is no need to rebuild the symbolic links. If you are using macOS Catalina or later follow the instructions above to enable the application. Then run

```
cd
sage --version
```

which again *may* generate quite a few lines of output and finally end with a line giving the version number of the sage you are running.

2. USING SageTeX WITH T_EXShop's latexmk BASED ENGINES

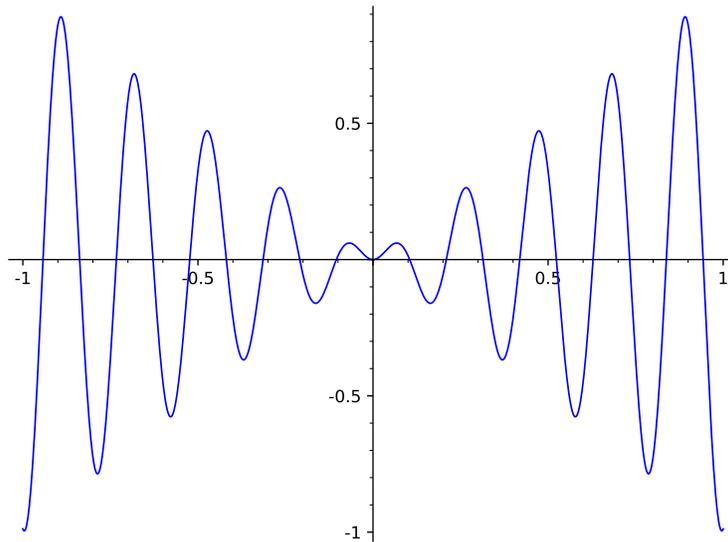
You can use any of T_EXShop's basic latexmk engines, (pdf/x_e/lua)latexmk, with SageTeX. Just have the enclosed platexmkrc file, written by John Collins, the maintainer of latexmk. in the same folder as the file that gets typeset.

3. SAMPLE

This is an example of using Sage within a T_EX document. We can compute extended values like

$$32^{31} = 45671926166590716193865151022383844364247891968$$

We can plot functions like $x \sin x$:



We can integrate:

$$\int \frac{x^2 + x + 1}{(x-1)^3(x^2 + x + 2)} dx$$

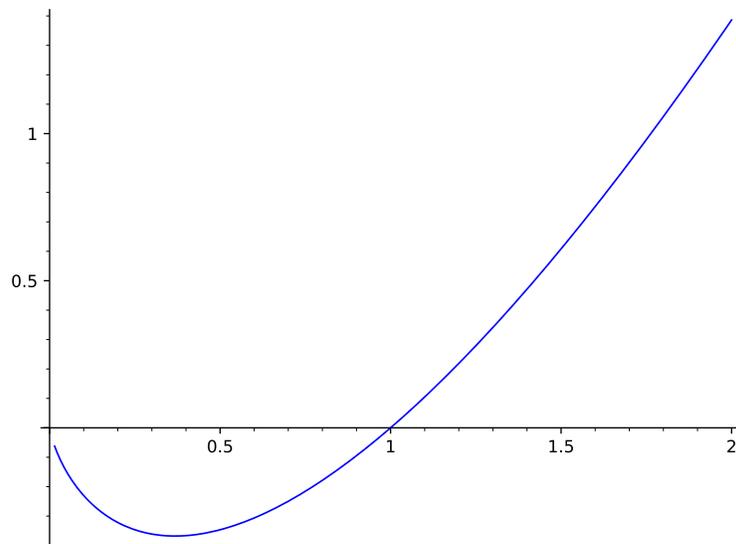
$$= -\frac{9}{448} \sqrt{7} \arctan\left(\frac{1}{7} \sqrt{7}(2x+1)\right) - \frac{3(x+1)}{16(x^2 - 2x + 1)} + \frac{5}{128} \log(x^2 + x + 2) - \frac{5}{64} \log(x-1)$$

We can perform matrix calculations:

$$\begin{pmatrix} 468 & 576 & 684 \\ 1062 & 1305 & 1548 \\ 1656 & 2034 & 2412 \end{pmatrix}$$

$$AB = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 5 & 6 \\ 6 & 8 \end{pmatrix} = \begin{pmatrix} 17 & 22 \\ 39 & 50 \end{pmatrix}$$

Plots are fun; here is a second one showing $x \ln x$. The “width” command in the source is sent to the include graphics command in LaTeX rather than to Sage.



Sage understands mathematical constants and writes them symbolically unless it is told to produce a numerical approximation. The term $e\pi$ below is not in the LaTeX source; instead it is the result of a Sage calculation, as is the numerical value on the other side of the equal sign.

The product of e and π is $\pi e = 8.53973422267357$.