

Sage and latexmk

1 Setup

Go to <https://github.com/3-manifolds/Sage_macOS/releases> and download the latest version of SageMath-x.x_x86_64.dmg/SageMath-x.x_arm64.dmg (depending upon your Mac, where x.x is the version number of Sage in the app; it was version 9.5 at the time of this writing). Open the .dmg file and copy the SageMath-x.x.app to the /Applications folder. *Don't rename it.*

Double-Click the Recommended_x.x.pkg and follow the instructions. This installs an executable sage script in /usr/local/bin, a current version of the sagetex.sty where \TeX can find it and additional information for those folks using Jupyter (not relevant for sagetex). If you previously installed SageMath you will be asked if you wish to overwrite the older versions of the sage script and the sagetex.sty package; agree to the replacement.

Finally open the SageMath-x.x application and follow the directions until you get a dialog box that gives you a choice of opening sage in a Terminal window or Jupyter Notebook and Quit. This initializes the application in macOS.

When the SageMath application is updated (e.g., to SageMath-9.6) simply follow the directions above and finally remove the older version.

2 Using SageTeX with \TeX Shop's latexmk based engines

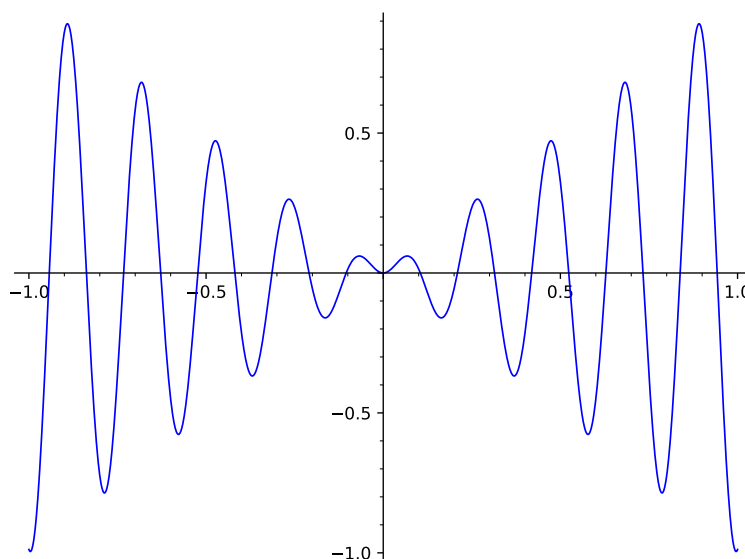
You can use any of \TeX Shop's basic latexmk engines, (pdf/x ϵ /lua)latexmk, with SageTeX. Just have the enclosed platexmkrc file, written by John Collins, the maintainer of latexmk, in the same folder as the file that gets typeset.

3 Sample

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

$$32^{31} = 45671926166590716193865151022383844364247891968$$

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



We can integrate:

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

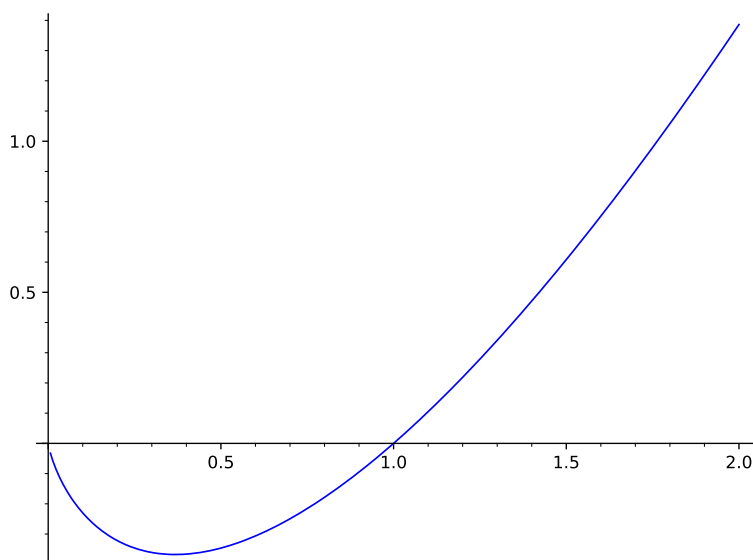
$$= -\frac{9}{448} \sqrt{7} \arctan\left(\frac{1}{7} \sqrt{7}(2x+1)\right) - \frac{3(x+1)}{16(x^2-2x+1)} + \frac{5}{128} \log(x^2+x+2) - \frac{5}{64} \log(x-1)$$

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 $\pi e = 8.53973422267357$.