

USING SAGE WITH LATEXMK

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1. SAGE AND LATEXMK

This document is independent of the other material in this folder, and explains how to use Sage with TeX if you want to use latexmk.

2. SETUP

Download and install the SageMath application in /Applications. It will install as SageMath-x.x.app where x.x is a version number. Remove the -x.x from the application name to get Sagemath.app. Make a symbolic link of the sage executable in /usr/local/bin:

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

and then 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:

```
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.sty .
sudo mktexlsr
```

to allow T_EX to use the sagetex package.

3. USING SAGE AND LATEXMK

Inside "TeXShop/Engines/Inactive/Sage/Sage and latexmk" there is a file named "platexmkrc". Create a folder for your new document and add a copy of platexmkrc to this folder. Create the document as usual in the folder, making sure that the top line is

```
% !TEX TS-program = pdflatexmk
```

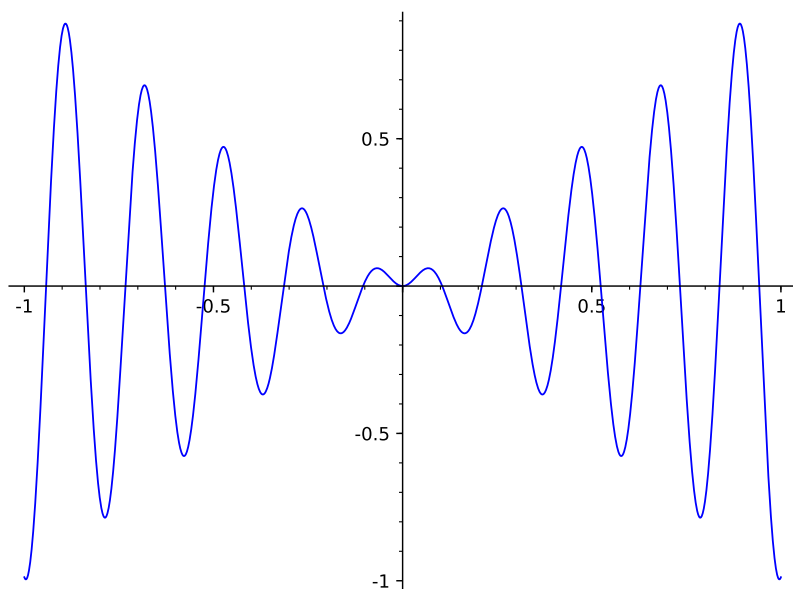
Then typesetting will use pdflatexmk and the resource file platexmkrc, and cooperate nicely with Sage.

4. INTRODUCTION

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:

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

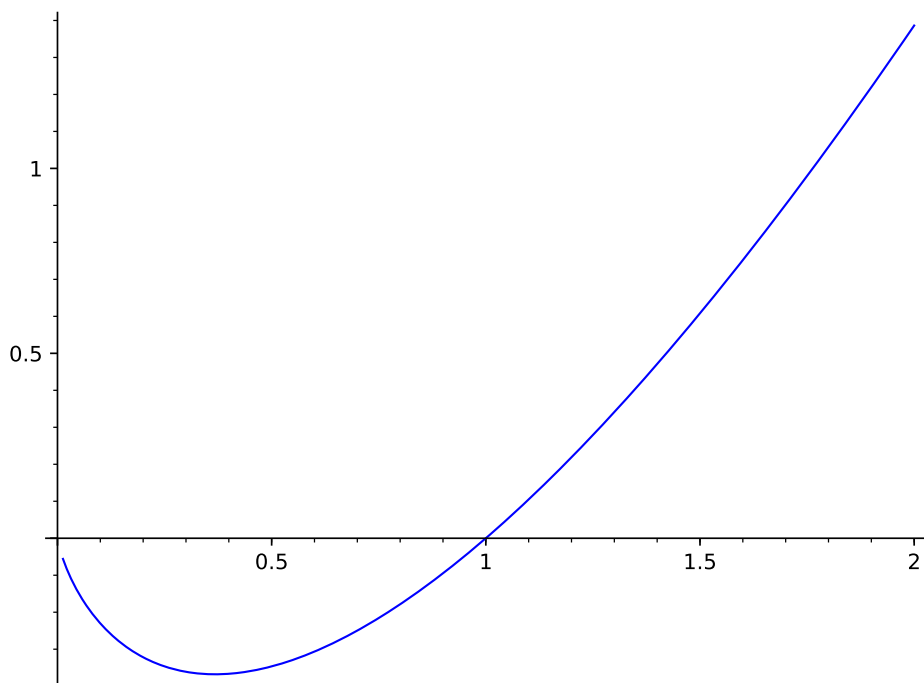
$$= -\frac{9}{448} \sqrt{7} \arctan\left(\frac{1}{7} \sqrt{7}(2x+1)\right) - \frac{3(x+1)}{16(x^2 - 2x + 1)} + \frac{5}{128} \log(x^2 + x + 2) - \frac{5}{64} \log(x-1)$$

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 $\pi e = 8.53973422267357$.