

# SympyTeX example

Tim Molteno\*

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## 1 Important! Setting up Your L<sup>A</sup>T<sub>E</sub>X environment

To use SympyTeX, you have to run latex (or pdflatex) on your file, then python, and then latex again.

```
latex example.tex
python example.sympy
latex example.tex
```

If you use Kile, or another L<sup>A</sup>T<sub>E</sub>X environment, you can set it up to automatically do the sympy python command as part of your build process.

## 2 Introduction

Using sympy within your L<sup>A</sup>T<sub>E</sub>X document is as easy as  $2 + 2 = 4$ .

You can write a block, and then use the variables defined later in your code!

```
x = sympy.Symbol('x')
h = sympy.integrate(1+x,x)
```

The variable  $h$ , how can be called using `\sympy{h}`, and you will get  $h = x + \frac{1}{2}x^2$ . Similarly, the integral of  $1 + x^4$  is  $x + \frac{1}{5}x^5$ .

## 3 sympyplain

The sympyplain command places the sympy output as text (rather than LaTeX formatted math stuff). This is really useful if the output is huge as formulae don't line wrap.

The integral of  $1 + x^4$  is also `x + x**5/5`.

```
from sympy import *
e = 1/cos(x)
```

The series expansion is  $1 + \frac{1}{2}x^2 + \frac{5}{24}x^4 + \frac{61}{720}x^6 + \frac{277}{8064}x^8 + \mathcal{O}(x^{10})$ .

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\*tim@physics.otago.ac.nz

### 3.1 Invisibly sympy code

Placing a `sympysilent` block in your code, allows you do do things like define symbols without making a mess. The rotation matrix is through an angle  $\theta$  around the  $z$ -axis is

$$R(\theta) = \begin{pmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{pmatrix}.$$

## 4 Plotting

Plotting works using the `sympyplot` command. This takes a matplotlib figure as a parameter. Have a look at the example below.

```
import matplotlib
import matplotlib.pyplot as plt
plt.matplotlib.rc('text', usetex = True)
import pylab
fig = plt.figure()
ax = fig.add_subplot(111)
t = pylab.linspace(0,10,400)
ax.plot(t, sin(3*t), '- ',
        t, sin(0.3*t**2), '-- ',
        t, cos(t), '-. ')
ax.legend((r'$A^{\omega}$', r'$A^{2\omega}$', r'$A^{3\omega}$'),
          shadow = False, loc = (0.75, 0.1))
ax.set_xlabel(r'$\gamma_1 + \gamma_2$', {'fontsize' : 20 })
ax.set_ylabel(r'$A^{n\omega}$ (dB)', {'fontsize' : 20 })
```

Here we're using matplotlib! So this sympytex package is really not quite named properly.

The syntax is `\sympyplot[<includegraphics opts>][fmt]{figure}` where:

- `fmt` can be one of pdf,eps,png,jpg or many more. If it is omitted, then an appropriate choice will be made for you.
- `<figure>` is a matplotlib figure object

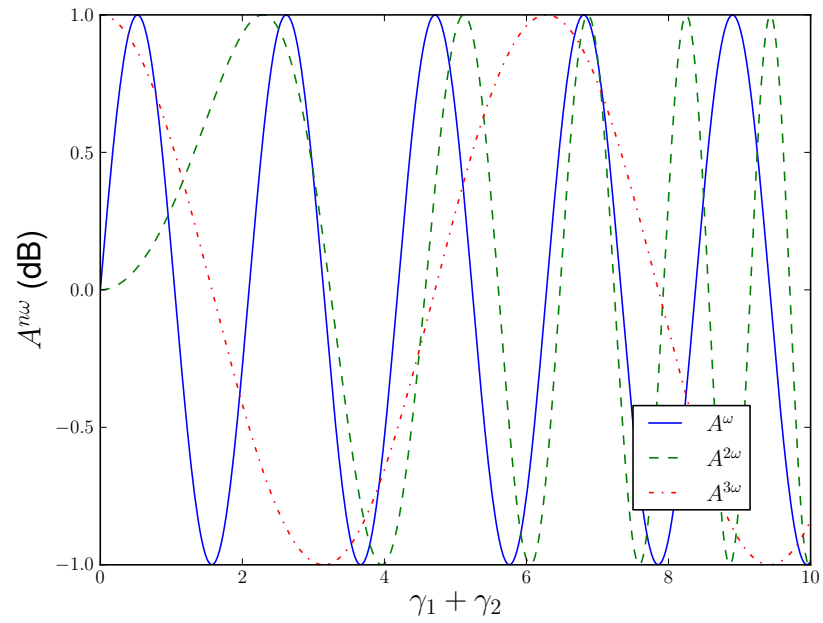


Figure 1: The graph generated from `\sympyplot[width=\linewidth]{fig}`