LaTeX-α

LaTeX Meets Wolfram

LaTeX-α is a LaTeX package which incorporates the typesetting ease and control of LaTeX with the power of the Wolfram Language. The goal of **LaTeX-α** is to provide the most complete, powerful and self-sufficient typesetting environment.

```
\usepackage{latexalpha}
```

Calculations

LaTeX-α allows for inline calculations, making scientific or mathematical document typesetting simpler and more streamlined. The examples below show that **LaTeX-α** has the full capabilities of the Wolfram Language, and thus knows mathematical constants, can solve integrals and can differentiate symbolically.

A basic example:

```
$3+4=\calc{3+4}$
```

$$\overbrace{3+4}^{\text{Typed in LaTeX}} = \overbrace{7}^{\text{Calculated by the Wolfram Cloud}}$$

Some more advanced examples:

```
$3\times4\sin\left(\frac{\pi}{4}\right)=$\calc{3*4 Sin[Pi/4]}$
```

$$3 \times 4 \sin\left(\frac{\pi}{4}\right) = 6\sqrt{2}$$

```
$\int_{10}^{35} e^{5x} dx=$\calc{Integrate [Exp[5*x], {x,10,35}]//N}$
```

$$\int_{10}^{35} e^{5x} dx = 2.00708 \times 10^{75}$$

```
$\frac{d}{dx}x^2\log(x)=\calc{D[x^2 Log[x], x]}$
```

$$\frac{d}{dx} x^2 \log(x) = x + 2x \log(x)$$

```
$\cos(\frac{\pi}{4})\approx
\sum_{n=0}^3 \frac{(-1)^n \left(\frac{\pi}{4}\right)^{2n} }{(2n)!}=
\calc{Total[Table[(-1)^n  (Pi/4)^(2 n)/((2 n)!), {n, 0, 3}]] // N}$
```

$$\cos(\frac{\pi}{4}) \approx \sum_{n=0}^{3} \frac{(-1)^n \left(\frac{\pi}{4}\right)^{2n}}{(2n)!} = 0.707103$$

Some Useful Wolfram Language Functions

`N[ ]`

If you wrap your calculation in this function it will return a numerical value. For example, e^2 would become 7.38906 .

`ScientificForm[Expression, Precision]`

This will give you a value in scientific notation. For example `ScientificForm[142342123342., 3]` will become 1.42×10^{11}.

Graphics

the *\graphic* command generates a graphic and saves it to your directory to be used later in your LaTeX document.

```
\graphic{Plot[ Tan[x], {x, 0, 2*Pi}]}{tan}
```

```
\begin{figure}[h!]
\centering
\includegraphics[width=0.6\textwidth]{tan.png}
\caption{Plot of $\tan(x)$ generated with the Wolfram API}
\end{figure}
```

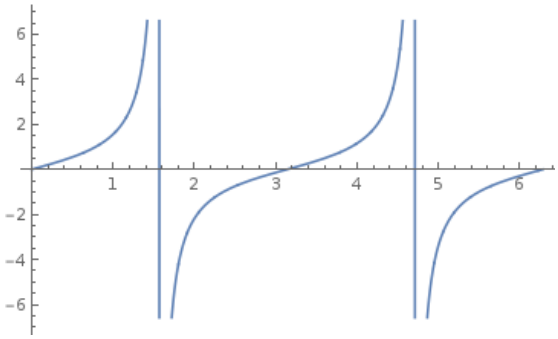

Figure 1: Plot of $\tan(x)$ generated with the Wolfram API

```
\graphic{ListPlot[ {1,2,2.5,2.9,3} ,PlotStyle->Red,Axes->False,Frame->True]}{plot}

\begin{figure}[h!]
\centering
\includegraphics[width=0.6\textwidth]{plot.png}
\caption{Some points plotted with the Wolfram API}
\end{figure}
```

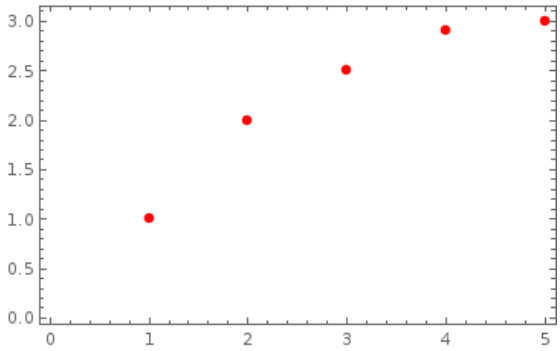

Figure 2: Some points plotted with the Wolfram API

Additionally, LaTeX-α supports error bars.

```
\graphic{ErrorListPlot[{{0.5,0.1},{1,0.1},{1.7,0.5},{2,0.1},{3,0.2}}]}{plot}

\begin{figure}[h!]
\centering
\includegraphics[width=0.6\textwidth]{plot.png}
\caption{Error Plot generated with the Wolfram API}
\end{figure}
```

The *graphic* command is (as the name would suggest) not restricted to scientific or mathematical plots.

```
\graphic{GeoGraphics[Frame->True]}{map}

\begin{figure}[h!]
\centering
\includegraphics[width=0.6\textwidth]{map.png}
\caption{A map}
\end{figure}
```

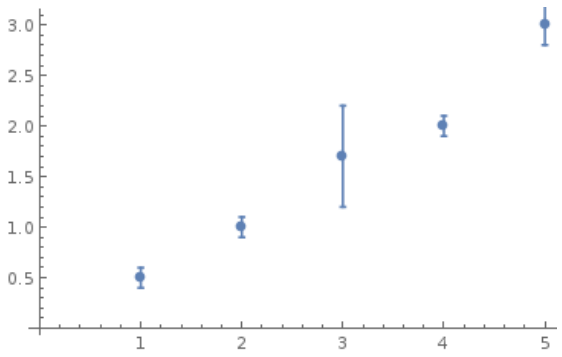

Figure 3: Error Plot generated with the Wolfram API

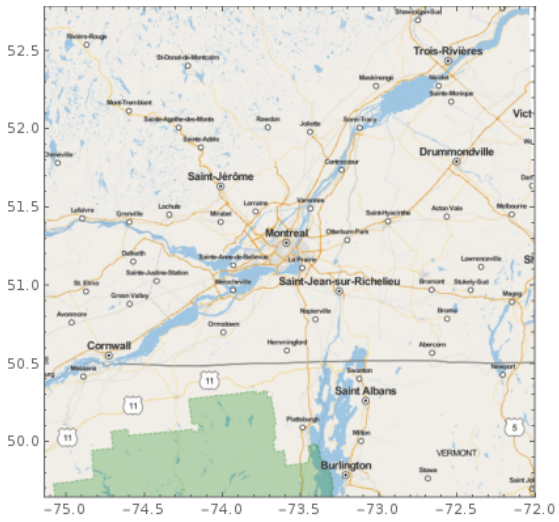

Figure 4: A map

Using Data Files

If you would like to make a plot using data stored in files on your computer, you can use LaTeX-α 's $\backslash dataplotTXT$ command.

The file *data.txt* contains a list of numbers generated using the Wolfram Language.

```
\dataplotTXT{data.txt}{ListLinePlot}{dataplot}

\begin{figure}[h!]
\centering
\includegraphics[width=0.6\textwidth]{dataplot.png}
\caption{Plot of random dataset stored in a separate file}
```

```
\end{figure}
```

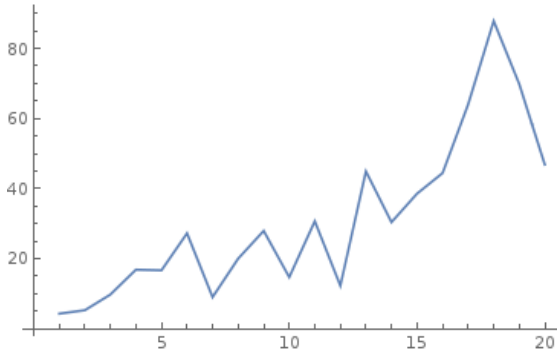

Figure 5: Plot of random dataset stored in a separate file

3D Graphics

LaTeX-α also allows for remote 3D graphics, such as this quadratic , this sphere and this sinusoid . This functionality requires that the CDF plugin is installed on you computer

Wolfram Alpha

Additionally, **LaTeX-α** can take Wolfram Alpha input and insert the results into your document.

```
The biggest city in China is $\WolframAlpha{ biggest city in china }$.
```

The biggest city in China is Shanghai.