

# L<sup>A</sup>T<sub>E</sub>X- $\alpha$

## L<sup>A</sup>T<sub>E</sub>X Meets Wolfram

L<sup>A</sup>T<sub>E</sub>X- $\alpha$  is a L<sup>A</sup>T<sub>E</sub>X package which incorporates the typesetting ease and control of L<sup>A</sup>T<sub>E</sub>X with the power of the Wolfram Language. The goal of L<sup>A</sup>T<sub>E</sub>X- $\alpha$  is to provide the most complete, powerful and self-sufficient typesetting environment.

**L<sup>A</sup>T<sub>E</sub>X- $\alpha$  is a work in progress. Please keep checking back for updates by clicking the title.**

`\usepackage{latexalpha}`

### Calculations

L<sup>A</sup>T<sub>E</sub>X- $\alpha$  allows for inline calculations, making scientific or mathematical document typesetting simpler and more streamlined. The examples below show that L<sup>A</sup>T<sub>E</sub>X- $\alpha$  has the full capabilities of the Wolfram Language, and thus knows mathematical constants, can solve integrals and can differentiate symbolically.

A basic example:

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

$$\overbrace{3+4}^{\text{Typed in L<sup>A</sup>T<sub>E</sub>X}} = \overbrace{7}^{\text{Calculated by the Wolfram Cloud}}$$

Some more advanced examples:

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

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

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

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

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

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

```


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


```

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### Using the Greek Alphabet

The `\calc` command is equipped with a special function to use greek characters, `Greek[ ]`.

```


$$(\lambda + 4)^3 (\lambda - 1) = \text{Expand}[\text{Greek}[\text{Lambda}] + 4]^3 (\text{Greek}[\text{Lambda}] - 1)$$


```

$$(\lambda + 4)^3 (\lambda - 1) = \lambda^4 + 11\lambda^3 + 36\lambda^2 + 16\lambda - 64$$

For capital greek letters, prepend "Capital". For example, `Greek[CapitalOmega]` becomes  $\Omega$ .

### 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  $1.42 \times 10^{11}$ .

## Graphics

the `\graphic` command generates a graphic and saves it to your directory to be used later in your  $\text{\LaTeX}$  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}
```

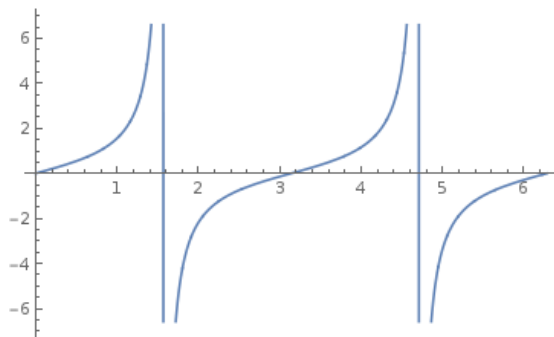


Figure 1: Plot of  $\tan(x)$  generated with the Wolfram API

```
\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}
```

Additionally,  $\text{\LaTeX-}\alpha$  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}
```

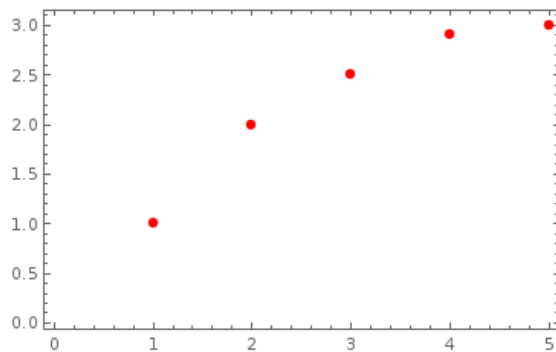


Figure 2: Some points plotted with the Wolfram API

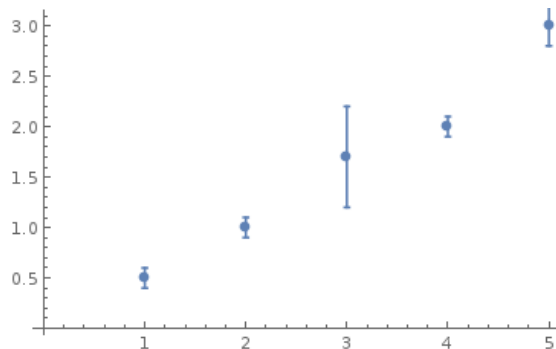


Figure 3: Error Plot generated with the Wolfram API

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}
```

### Using Data Files

If you would like to make a plot using data stored in files on your computer, you can use **L<sup>A</sup>T<sub>E</sub>X- $\alpha$** 's `\dataplotTXT` command.

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

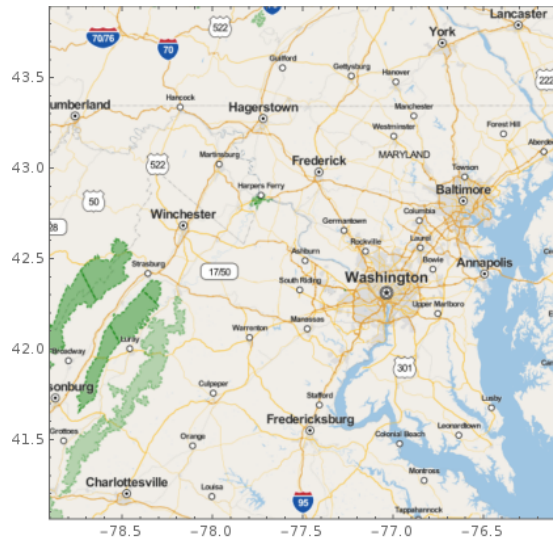


Figure 4: A map

```
\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}
```

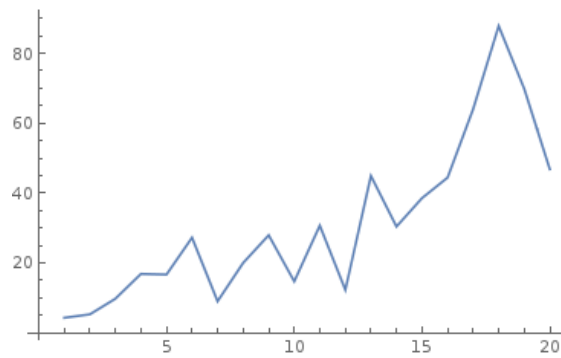


Figure 5: Plot of random dataset stored in a separate file

### 3D Graphics

**L<sup>A</sup>T<sub>E</sub>X- $\alpha$**  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 your computer

### Wolfram Alpha

Additionally, **L<sup>A</sup>T<sub>E</sub>X- $\alpha$**  can take Wolfram Alpha input and insert the results into your document.

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

The biggest city in Canada is Toronto.

The Empire State Building is  
`$\WolframAlpha{ how tall is the empire state building}$` tall.

The Empire State Building is 1250 Feet tall.