Using LaTeX

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Introduction

What is LaTeX?

Powerful (Mathematical) Typesetting Software

Developed by Donald Knuth, 1977

Very Light Programming Language

Easiest Way to Type Professional Looking Mathematics

The Standard for Typing Math

Other sciences and economics?

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Get your Own Free Copy

Mac: Download 'MacTex'

PC: Download 'MikTex'

Instructions and Links on Math Webpage

`http://www.plu.edu/math/latex/`

Probably 1-2 hours download and install time

Use Online Source

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How do I use LaTeX?

General Tips:

Copy existing templates.

Use online resources to answer questions.

- Google
- Stackexchange
- Detexify

Consult LaTeX help books.

Ask others (including me).

Spend a little time messing around.

How do I use LaTeX? (Specifics)

Necessary Overhead

```
\documentclass[12pt]{article}

\usepackage{amsmath, ulem, graphicx, amsthm, marvosym}

\begin{document}

"Writing Goes in Here"

\end{document}
```

Change margins, define shortcuts, general setup. We have provided a basic header with necessary packages and useful shortcuts.

How do I use LaTeX? (Specifics)

Necessary Overhead

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How do I use LaTeX? (Specifics)

Typing:

With header in place, now you can type just as you would a word document. But there are a few differences (since LaTeX is a programming language).

Typed	Output
`Tommy used to` `work on the docks.`	Tommy used to work on the docks.

`Tommy used to`
 	
`work on the docks.`
	Tommy used to
	work on the docks.

Special Characters

LaTeX has 10 special characters that are used for "programming."

\ - calls most commands

{ } - used for grouping

$ - used to enter inline mathematics mode

& - used as a divider

- used for programming purposes and defining macros

^ - used in for superscript

_ - used for subscript

% -used for making comments in the source code

~ - Non-linebreaking space

How do I use LaTeX? (Specifics)

Commands used in text

Typed	Output
`\textbf{Hi}`	**Hi**
`{\small size}`	size
`{\large size}`	size
`{\Large size}`	size
`\underline{Capstone}`	Capstone
`\textit{Italics}`	*Italics*
`{\sc Small caps}`	Small caps
`{Where are the braces?}`	Where are the braces?
`\begin{center}Math\end{center}`	Math

How do I use LaTeX? (Specifics)

Nice Features (lists)

Typed

```
\begin{enumerate}
\item
This
\item
is
\item
a
\item
list.
\end{enumerate}
```

Output

1. This
2. is
3. a
4. list.

Replace enumerate with itemize for unordered list.

How do I use LaTeX? (Specifics)

Nice Features (lists)

Typed

```
\begin{itemize}
\item
This
\item
is
\item
a
\item
list.
\end{itemize}
```

Output

- This
- is
- a
- list.

How do I use LaTeX? (Specifics)

Nice Features (images)

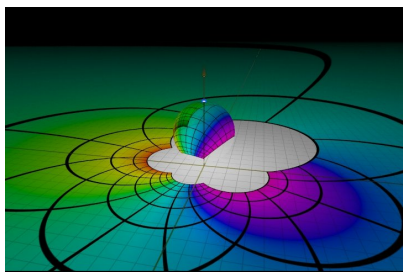
Typed

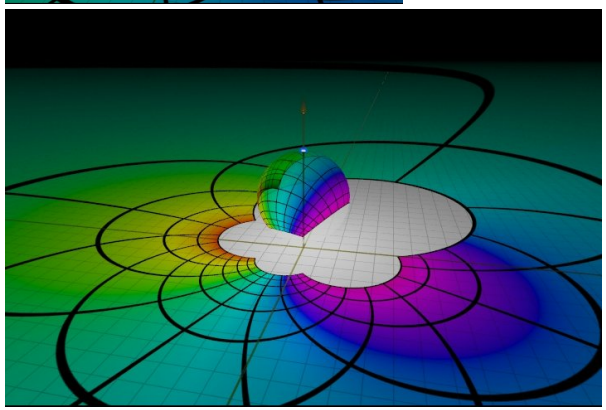
```
\usepackage{graphicx} (in header)

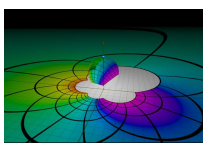
\includegraphics[width=1in]{mobius3.jpg}
\includegraphics[height=1in]{mobius3.jpg}

\begin{center}
\includegraphics[width=.5in]{mobius3.jpg}
\end{center}
```

Output







How do I use LaTeX? (Specifics)

Nice Features (tables)

Typed

```
\begin{tabular}{|c|c|c|}
\hline
P & Q & R\\
\hline
T & T & T\\
\hline
T & T & F\\
\hline
T & F & T\\
\hline
T & F & F\\
\hline
T & T & T\\
\hline
T & T & F\\
\hline
T & F & T\\
\hline
T & F & F\\
\hline
\end{tabular}
```

Output

P	Q	R
T	T	T
T	T	F
T	F	T
T	F	F
T	T	T
T	T	F
T	F	T
T	F	F

How do I use LaTeX? (Specifics)

Nice Features (Theorems, Definitions, Examples)

Typed

in header:

```
\usepackage{amsthm}
\newtheorem{theorem}{Theorem}
\theoremstyle{definition}
\newtheorem{definition}{Definition}
\newtheorem{example}{Example}
```

in writing area:

```
\begin{theorem}
There are infinitely many primes
\end{theorem}

\begin{example}
2, 3, 5 are prime numbers.
\end{example}

\begin{definition}
A prime number is a number...
\end{definition}
```

Output

Theorem 1. *There are infinitely many primes*

Example 1. 2, 3, 5 are prime numbers.

Definition 1. A prime number is a number...

How do I use LaTeX? (Specifics)

Mathematics

Typed

```
$\alpha, \beta, \gamma, \delta$

$\lim_{x\to 0}\frac{f(x)}{g(x)}$

$$\lim_{x\to 0}\frac{f(x)}{g(x)}$$

\[
\int_0^1 x^2 dx=\frac{x^3}{3}\Bigg|_0^1=\frac13 -\frac03=\frac13
\]
```

Output

$\alpha, \beta, \gamma, \delta$
$\lim_{x\to 0} \frac{f(x)}{g(x)}$

$$\lim_{x\to 0}\frac{f(x)}{g(x)}$$

$$\int_0^1 x^2 dx = \frac{x^3}{3}\Bigg|_0^1 = \frac{1}{3} - \frac{0}{3} = \frac{1}{3}$$

How do I use LaTeX? (Specifics)

Mathematics

Typed

```
$$\sum_{k=0}^\infty \frac{1}{2^k}=2$$
```

Output

$$\sum_{k=0}^{\infty} \frac{1}{2^k} = 2$$

```
$$A=\begin{pmatrix}
1 & 0 & 4 & -1\\
0 & 1 & -3 &1 \\
0 & 0 & 0 & 1 \\
\end{pmatrix}$$
```

$$A = \begin{pmatrix} 1 & 0 & 4 & -1 \\ 0 & 1 & -3 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

```
\newcommand\Z{\mathbb{Z}} (header)

$\Z$
$\mathbb{R}$
```

$\mathbb{Z}$
$\mathbb{R}$

How do I use LaTeX? (Specifics)

Mathematics (an example)

```
\begin{theorem}
\label{irrational}
For any $n\in\mathbb{N}$ with $n\geq 3$, $\sqrt[n]{2}$ is irrational.
\end{theorem}
\begin{proof}
Assume that $\sqrt[n]{2}$ is rational, then $\sqrt[n]{2}=\frac{p}{q}$ with $p,q\in\mathbb{Z}$.
So, we have
$$\begin{aligned}2&=\left(\frac{p}{q}\right)^n\\
&=\frac{p^n}{q^n}\end{aligned}$$
and so $q^n+q^n=p^n$, which contradicts Fermat's Last Theorem.
\end{proof}
```

Theorem 1. *For any $n \in \mathbb{N}$ with $n \geq 3$, $\sqrt[n]{2}$ is irrational.*

Proof. Assume that $\sqrt[n]{2}$ is rational, then $\sqrt[n]{2} = \frac{p}{q}$ with $p, q \in \mathbb{Z}$. So, we have

$$\begin{aligned} 2 &= \left(\frac{p}{q}\right)^n \\ &= \frac{p^n}{q^n} \end{aligned}$$

and so $q^n + q^n = p^n$, which contradicts Fermat's Last Theorem. □

How do I use LaTeX?

- Much more functionality
  - Page Numbering and Page Layout
  - Bibliography
  - Macros and commands
  - Figures
  - Packages
  - Slides
- Basics are easy to use to get started
- Learning Curve
- Knowing commands
- Copy/paste
- Speed and Professionalism
- Alternatives
- Programming

Concluding Remarks

Use on blogs:

```
$latex F(\alpha)=\beta$
```

Use on websites with MathJax (Wikipedia, etc.)

Why do we care?

Can you use something else?

Questions?

Concluding Remarks

Use on blogs:

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$latex F(\alpha)=\beta$
```

Use on websites with MathJax (Wikipedia, etc.)

Why do we care?

Can you use something else?

Questions?

Interesting Reads about LaTeX

Good Twitter feed: @TeXtip

`https://twitter.com/#!/TeXtip`

Essay about the Beauty of LaTeX over others

`http://nitens.org/taraborelli/latex`

Interview with Donald Knuth

`https://github.com/kragen/knuth-interview-2006`

These slides will be available on `http://www.plu.edu/math/latex`