LaTeX

Introduction to LaTeX

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- What is LaTeX?
  A "markup" language for typesetting

- What are its key features?
  Flexibility; mathematical typesetting; community support

- Where do I get the software?
  TeX Users Group online

- How do I learn to use it?
  Reference manuals/books, online sources, . . .

Learning about LaTeX

- Grätzer, *Practical LaTeX*, Springer 2014.
  link.springer.com/book/10.1007/978-3-319-06425-3

- Grätzer, *More Math into LaTeX, 4th Edition*, Springer, 2007.
  link.springer.com/book/10.1007/978-0-387-68852-7

- van Dongen, *LaTeX and Friends*, Springer, 2012.
  link.springer.com/book/10.1007/978-3-642-23816-1

- Getting Started with TeX, LaTeX, and Friends:
  www.tug.org/begin.html

- en.wikibooks.org/wiki/LaTeX

TEXShop
Mac

TEXworks
Mac, Windows, Linux

A sample document with page margins

```
\documentclass[11pt]{article}
\usepackage[left=1in,
            right=1in,
            top=0.75in,
            bottom=0.5in]{geometry}

\begin{document}
    Hello, world!
\end{document}
```

Every document has a preamble and a body.

Some useful packages

```
\usepackage{amsmath}          % AMS enhancements
\usepackage{amsthm}           % theorem environments
\usepackage{amssymb,latexsym} % more symbols
\usepackage{graphicx}         % Graphics inclusion
```

Packages are declared in the preamble of the LaTeX source file.

These characters have special meaning:

#	$	&	_	%	{	}

A \ prefix avoids this special meaning:

\#	\$	\&	_	\%	\{	\}

LATEX command syntax

```
\command[optional]{required}

   or

\command[optional]{required}{required}
```

Examples:

```
\section{Introduction}
\hspace{2in}
\rule[0.5in]{1in}{2in}
```

LATEX environments

```
\begin{environment-name}
   ...
\end{environment-name}
```

Examples:

- quote
- center
- enumerate
- itemize
- tabular

The itemize environment

LaTeX code

```
\begin{itemize}
   \item Planes
   \item Trains
   \item Automobiles
\end{itemize}
```

Typeset result

- Planes
- Trains
- Automobiles

The enumerate environment

LaTeX code

```
\begin{enumerate}
   \item Planes
   \item Trains
   \item Automobiles
\end{enumerate}
```

Typeset result

1. Planes
2. Trains
3. Automobiles

Adjusting font attributes

LATEX code

```
...normal, \emph{emphasized}, \textbf{bold},
\texttt{typewriter}, normal...
```

Typeset result

... normal, *emphasized*, **bold**, `typewriter`, normal...

Formatting tables

LaTeX code

```
\begin{tabular}{l|c|r}
President        & Party      & Term \\ \hline \hline
Jimmy Carter     & Democrat   & 1977--1981 \\ \hline
Abraham Lincoln  & Republican & 1861--1865 \\ \hline
\end{tabular}
```

Typeset result

President	Party	Term
Jimmy Carter	Democrat	1977–1981
Abraham Lincoln	Republican	1861–1865

Formatting tables

Like most things in LaTeX, tables have many options.

You can find more information about tables in the previous references or the following:

- en.wikibooks.org/wiki/LaTeX/Tables
- www.tug.org/pracjourn/2007-1/mori/mori.pdf
- www1.maths.leeds.ac.uk/latex/TableHelp1.pdf

Typesetting mathematics

- In-line mathematics: mixed with text
  . . . $ mathematics text $ . . .

From algebra, we know $(a + b)^2 = a^2 + 2ab + b^2$ for any two real numbers a and b.

- Displayed mathematics: set off from text
  . . . \[mathematics text \] . . .

From algebra, we know

$$(a + b)^2 = a^2 + 2ab + b^2$$

for any two real numbers a and b.

Subscripts and superscripts

LaTeX code

```
$x^2 + y^2$
$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
$\int_0^\pi x^2 dx$
$\displaystyle \int_0^\pi x^2 dx$
```

Typeset result

$x^2 + y^2$

$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$\int_0^\pi x^2 dx$

$$\int_0^\pi x^2 dx$$

More about subscripts and superscripts

LaTeX code

```
$2^{a + b}$
$A_{i + 1,j}$
$2^{2^{2^{n}}}$
$A_{i, j}^{k}$
```

Typeset result

2^{a+b}

$A_{i+1,j}$

$2^{2^{2^n}}$

$A_{i,j}^k$

Aligning multi-line equations

LaTeX code

```
\begin{align*}
(a+b)(a-b) &=  a^2 - ab + ab - b^2\\
           &=  a^2 - b^2
\end{align*}
```

Typeset result

$$(a + b)(a - b) = a^2 - ab + ab - b^2$$
$$= a^2 - b^2$$

Aligning multi-line equations with side notes

LaTeX code

```
\begin{align*}
(a+b)(a-b) &=  a^2 - ab + ab - b^2 && \text{Side} \\
           &=  a^2 - b^2              && \text{notes}
\end{align*}
```

Typeset result

$$
\begin{aligned}
(a+b)(a-b) &= a^2 - ab + ab - b^2 && \text{Side} \\
&= a^2 - b^2 && \text{notes}
\end{aligned}
$$

A few functions

\cos \log \lim \ln \log \sin \tan

LATEX code

`$\sin^2 x  + \cos^2 x = 1$`

Typeset result

$$\sin^2 x + \cos^2 x = 1$$

Fractions

`\frac{numerator}{denominator}`

LaTeX code

`\[ \frac{a^2 - b^2}{a + b} = a - b \]`

Typeset result

$$\frac{a^2 - b^2}{a + b} = a - b$$

A few relations

\neq	\leq	\approx	\subset	\in	\not\in

Typeset result

$\neq$	$\leq$	$\approx$	$\subset$	$\in$	$\notin$

Sampling the Greek alphabet

LATEX code

`\alpha`	`\beta`	`\gamma`	`\delta`	`\epsilon`

Typeset result

α	β	γ	δ	ϵ

LATEX code

`\Gamma`	`\Delta`	`\Theta`	`\Sigma`	`\Omega`

Typeset result

Γ	Δ	Θ	Σ	Ω

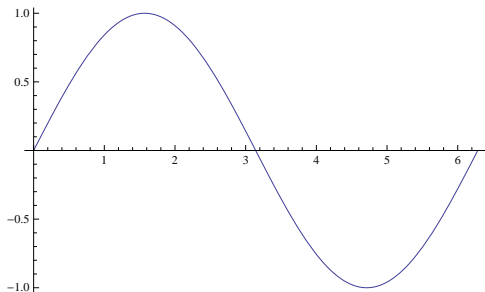## Including graphics

Suppose you have a graphics file named `sine.pdf`

```
\includegraphics[width=2.5in]{sine}
```


Graphics files can be generated and exported by a wide variety of computer programs — this one is from Mathematica.

To do. . .

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Typeset the sample page

Refer to Appendix B of Grätzer's book