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?
  TeXLive DVD or TeX Users Group online

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

- Kopka and Daly, *Guide to LaTeX, 4th Edition*, Addison-Wesley, 2003.
  `http://proxy.library.eiu.edu:2932/9780321617736/`

- Grätzer, *More Math into LaTeX, 4th Edition*, Springer, 2007.
  `http://proxy1.library.eiu.edu:2112/book/10.1007%2F978-0-387-68852-7`

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

- LaTeX (a Wikibook):
  `http://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.

Special characters

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

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

$x^2 + y^2$

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

$\int_0^\pi x^2 dx$

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

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

$$(a + b)(a - b) = a^2 - ab + ab - b^2 \qquad \text{Side}$$
$$= a^2 - b^2 \qquad \text{notes}$$

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

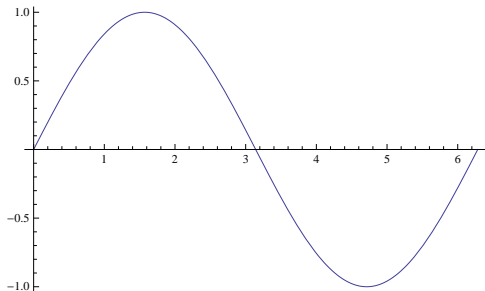| Γ	Δ	Θ	Σ	Ω

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.

Typeset the sample page

Refer to Appendix B of Grätzer's book