Pronounced “Lay Tech”
Getting Started In \LaTeX

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Outline:

• Starting materials.

• Text in $\LaTeX$.

• Math formulae in $\LaTeX$.

• Resources.
(1) **Starting Materials.**

- An editor (*WinEdt*)

- \LaTeX\ implementation (*MIKTeX*)

- Templates (*What type of document: article, slide, etc.*)
Basic Template for an “Article”

\documentclass{article}
\usepackage{amsmath}
\usepackage{amssymb}
\begin{document}
%Write your content here.
%The percent denotes a comment!
\end{document}
A first example.

\documentclass{article}
\usepackage{amsmath}
\usepackage{amssymb}
\begin{document}
\begin{center}
Why “Lord of the Rings” Rules
\end{center}
It just does. Period.
\end{document}
(2) **Text in \LaTeX.**

Font styles.

This is fun.
\textbf{This is fun.} \%Boldface
\it{This is fun.} \%Italicise

---

This is fun.

**This is fun.**

*This is fun.*
Vertical spacing

This is fun. Truly it is.

%The \ denotes a new line
This is fun. \Truly it is.

%\vspace{length} also denotes vertical spacing

This is fun. Truly it is.

This is fun.
Truly it is.
Horizontal spacing

\begin{itemize}
  \item Yo yo
  \item Yo\,, yo \% \, denotes 1 space
  \item Yo\;yo \% \; denotes 2 spaces
  \item Yo\quad yo \% \quad denotes 4 spaces
  \item Yo\qquad yo \% \qquad denotes 8 spaces
  \item \%\hspace{length} also denotes horizontal spacing
\end{itemize}

\begin{itemize}
  \item Yo yo
  \item Yo yo
  \item Yo yo
  \item Yo yo
  \item Yo yo
  \item Yo yo
\end{itemize}
Centering

\begin{center}
Akira Kurosawa
\end{center}

The great Japanese director who arguably made the most ‘western’ of movies in the Far East.

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Reserved symbols

Ampersand: Use `\&`
Left brace: Use `\{`
Right brace: Use `\}`

Dollar: Use `\$
Percent: Use `\%`
Pound: Use `\#
Underscore: Use `\_`
(3) **Math formulae in \LaTeX.**

- Use dollar signs $ to **begin** and **end** a mathematical expression.

- Similarly, use **double dollar signs** $$$ (begin and end) for centering a mathematical expression.

- When in doubt, use braces!
Examples: Arithmetic.

\[(2 + 3) \times (5 - 3) = 10\]

$$\left(3^2 \cdot 2^{11}\right)/18 = 1024$$

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\[(3^2 \cdot 2^{11})/18 = 1024\]
Examples: More Arithmetic.

% Fractions: Use \frac{num}{denom}.
\[
\frac{1}{3} + \frac{7}{12} = \frac{11}{12}
\]

% Square roots: Use \sqrt{k}.
% n-th roots: Use \sqrt[n]{k}.
\[
\sqrt{5} + \sqrt[3]{11}
\]

\[
\frac{1}{3} + \frac{7}{12} = \frac{11}{12}
\]

\[
\sqrt{5} + \sqrt[3]{11}
\]
Examples: Comparison Symbols.

The $>$, $<$, and $=$ signs are as usual.

\[
\begin{align*}
5 \neq 3 \\
5 \geq 3 \\
3 \leq 5 \\
1 \equiv 5 \mod 4 \\
1 \not\equiv 2 \mod 4
\end{align*}
\]
Examples: Sets.

Use backslashes with the curly braces!

\[
\mathbb{N} = \{1, 2, 3, \ldots\}
\]
\[
\mathbb{Q} = \{\frac{m}{n} \mid m,n \in \mathbb{Z} \text{ and } n \neq 0\}
\]

\[N = \{1, 2, 3, \ldots\}\]
\[Q = \{\frac{m}{n} \mid m, n \in \mathbb{Z} \text{ and } n \neq 0\}\]
Examples: Mathematical lettering.

\text{P}\quad %non-algebraic letters in math mode
\text{P}\quad %algebraic letter
\text{mathbb{P}}\quad
\text{mathcal{P}}\quad
\text{mathfrak{P}}\quad %gothic (fraktur) letter
Examples: Greek lettering.

Use a backslash before the letter.

\[ \alpha \quad \xi \quad \delta \quad \Delta \]

\[ \alpha \quad \xi \quad \delta \quad \Delta \]
Examples: Functions.

Define $\phi : \mathbb{C} \to \mathbb{C}$ by
$$\phi(z) = \frac{az + b}{cz + d}.$$
Examples: Special Functions.

Use backslashes before the abbreviations. Braces or parentheses may be used to hold their arguments.

\[
\sin{x}\\
\cos(3\theta)\\
\ln(a^{x^2}) = x^2 \ln{a}
\]

\[
\sin x \\
\cos(3\theta) \\
\ln(a^{x^2}) = x^2 \ln a
\]
Examples: An algebra example.

\textbf{The Quadratic Formula:} \(\text{\\}
\) Given a quadratic equation \(ax^2 + bx + c = 0\)

with \(a \neq 0\), its solutions are given by

\[x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.\]

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Example: Summation.

$$\sum_{n = 1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

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Example: Limits and Derivatives.

\[
\lim_{x \to 5} (x^2 + 5) = 30 \quad \lim_{x \to 5} (x^2 + 5) = 30 \quad \frac{d}{dx} (e^{3x}) = 3 e^{3x}
\]

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\frac{d}{dx}(e^{3x}) = 3e^{3x}
\]
Example: Integrals.

\[ \int 3x^2 \, dx = x^3 + C \]
\[ \int_{0}^{1} 3x^2 \, dx = 1 \]
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Creating lists.

Use “enumerate” or “itemize” (with begin and end tags).

\begin{enumerate}
\item $\int 3x^2 \, dx = x^3 + C$
\item $\displaystyle\int_{0}^{1} 3x^2 \, dx = 1$
\end{enumerate}
Nested lists.

\begin{enumerate}
\item Differentiate the following functions.
\begin{enumerate}
\item $y=3x^4-2x+e^x-7$
\item $y=2x^5\sin{x}$
\end{enumerate}
\item Find the equation of the tangent line to $y=4\cos(2x)$ at $x=\frac{\pi}{12}$.
\end{enumerate}
1. Differentiate the following functions.

   (a) \( y = 3x^4 - 2x + e^x - 7 \)

   (b) \( y = 2x^5 \sin x \)

2. Find the equation of the tangent line to \( y = 4 \cos(2x) \) at \( x = \frac{\pi}{12} \).
(4) **Resources.** (Both available online for free!)

- Not So Short Introduction to \texttt{\LaTeX}-2\(\varepsilon\), Tobias Oetiker et al.

- Math into \texttt{\LaTeX}, George Grätzer.