~~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)
- LaTeXimplementation (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}
```

Why “Lord of the Rings” Rules

It just does. Period.

(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

```
Yoyo
Yo\,yo % \, denotes 1 space
Yo\;yo % \; denotes 2 spaces
Yo\quad yo % \quad denotes 4 spaces
Yo\qquad yo % \qquad denotes 8 spaces

%\hspace{length} also denotes horizontal spacing
```

Yoyo
Yo yo
Yo yo
Yo yo
Yo yo

Centering

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

The great Japanese director who arguably made the

most ‘western’ of movies in the Far East.
```

Akira Kurosawa

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

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.

```
$(2 + 3) \times (5 - 3) = 10$
```

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

$(2 + 3) \times (5 - 3) = 10$

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

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.

```
$5 \neq 3$\\
$5 \geq 3$\\
$3 \leq 5$\\
$1 \equiv 5 \mod 4$\\
$1 \not\equiv 2 \mod 4$
```

$5 \neq 3$
$5 \geq 3$
$3 \leq 5$
$1 \equiv 5 \mod 4$
$1 \not\equiv 2 \mod 4$

Examples: Sets.

Use backslashes with the curly braces!

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

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

Examples: Mathematical lettering.

```
$\text{P}$\\ %non-algebraic letters in math mode
$P$\\ %algebraic letter
$\mathbb{P}$\\
$\mathcal{P}$\\
$\mathfrak{P}$\\ %gothic (fraktur) letter
```

P

P

$\mathbb{P}$

$\mathcal{P}$

$\mathfrak{P}$

Examples: Greek lettering.

Use a backslash before the letter.

```
$\alpha$\\
$\xi$\\
$\delta$\\
$\Delta$
```

α
ξ
δ
Δ

Examples: Functions.

```
Define $\phi : \mathbb{C} \to \mathbb{C}$ by

$\phi(z) = \frac{az + b}{cz + d}$.
```

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:}\\
Given a quadratic equation $ax^2 + bx + c = 0$

with $a \neq 0$, its solutions are given by
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$
```

The Quadratic Formula:
Given a quadratic equation $ax^2 + bx + c = 0$ with $a \neq 0$, its solutions are given by

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

Example: Summation.

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

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

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

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

Example: Limits and Derivatives.

```
$\lim_{x \to 5} (x^2 + 5) = 30$\\
$\displaystyle\lim_{x \to 5} (x^2 + 5) = 30$\\
$\frac{d}{dx} (e^{3x}) = 3 e^{3x}$
```

$\lim_{x \to 5} (x^2 + 5) = 30$

$\displaystyle\lim_{x \to 5} (x^2 + 5) = 30$

$\frac{d}{dx} (e^{3x}) = 3e^{3x}$

Example: Integrals.

```
$\int 3x^2 \, dx = x^3 + C$\\
$\int_{0}^{1} 3x^2 \, dx = 1$\\
$\displaystyle\int_{0}^{1} 3x^2 \, dx = 1$\\
```

$\int 3x^2 \, dx = x^3 + C$
$\int_0^1 3x^2 \, dx = 1$
$\displaystyle\int_0^1 3x^2 \, dx = 1$

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}
```

---

1. $\int 3x^2 \, dx = x^3 + C$

2. $\displaystyle\int_0^1 3x^2 \, dx = 1$

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}
```

Nested lists (continued).
(Output from previous slide)

---

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 LaTeX-2ε, Tobias Oetiker et al.

- Math into LaTeX, George Grätzer.