A Latex primer

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Empty document

```
\documentclass[10pt,a4paper]{book}
\usepackage[utf8]{inputenc}
\usepackage[english]{babel}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{graphicx}
\begin{document}
  ...
\end{document}
```

Title

```
\title{A presentation on Latex}
\author{Dr. Giuseppe Maggiore}
\maketitle
  ...
```

Sections and subsections

```
\section{Introduction}
  ...
  \subsection{Motivation}
    ...
  \subsection{Problem statement}
    ...
    \subsubsection{Points of interest of problem}
      ...
```

Text modifiers

```
Regular text, \textit{italic}, \textbf{bold},
  \texttt{typewriter}, \textsc{small caps},
  \textsf{sans serif}, \textsl{slanted},
  \emph{emphasis}
```

Result

Regular text, *italic*, **bold**, typewriter, SMALL CAPS, sans serif, *slanted*, *emphasis*

Lists

```
\begin{itemize}
  \item First item
  \item Second item
    \begin{itemize}
      \item Nested list item 1
      \item Nested list item 2
    \end{itemize}
\end{itemize}
```

Result

- First item
- Second item
  - Nested list item 1
  - Nested list item 2

Lists

```latex
\begin{enumerate}
  \item First item
  \item Second item
    \begin{enumerate}
      \item Nested list item 1
      \item Nested list item 2
    \end{enumerate}
\end{enumerate}
```

Result

1. First item
2. Second item
   1. Nested list item 1
   2. Nested list item 2

Lists

```
\begin{description}
  \item[First] The first item
  \item[Second] The second item
  \item[Third] The third
\end{description}
```

Result

First The first item

Second The second item

Third The third

Quotations

```
Isaac Newton summed up his own estimate of his work as
    follows:
\begin{quote}
I do not know what I may appear to the world; but to
myself I seem to have been only like a boy, playing
on the sea-shore, and diverting myself, in now and
then finding a smoother pebble, or a prettier shell
than ordinary, whilst the great ocean of truth lay
all undiscovered before me.
\end{quote}
```

Result

Isaac Newton summed up his own estimate of his work as follows:

> I do not know what I may appear to the world; but to myself I seem to have been only like a boy, playing on the sea-shore, and diverting myself, in now and then finding a smoother pebble, or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.

Pre-formatted text

```
\verb/\alpha/
```

Result

```
\alpha
```

Internal cross-references

```
\label{sec1:introduction}
As seen in \ref{sec1:introduction}, ...
```

Result

As seen in Section 11, ...

Tables

```
\begin{tabular}{|r|r|}
\hline
$n$&$n!$\\
\hline
1&1\\
2&2\\
3&6\\
\dots & \dots \\
\hline
\end{tabular}
```

Result

n	$n!$
1	1
2	2
3	6
...	...

Tables

```latex
\begin{tabular}{|l||l|l||l|l|}
\hline
 &\multicolumn{2}{l|}{Singular}&\multicolumn{2}{l|}{
      Plural}\\
\cline{2-5}
 &English&\textbf{Gaeilge}&English&\textbf{Gaeilge}\\
\hline\hline
1st Person&at me&\textbf{agam}&at us&\textbf{againn}\\
2nd Person&at you&\textbf{agat}&at you&\textbf{agaibh
     }\\
\hline
\end{tabular}
```
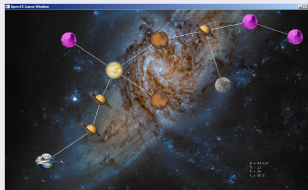
Result

	Singular		Plural	
	English	**Gaeilge**	English	**Gaeilge**
1st Person	at me	**agam**	at us	**againn**
2nd Person	at you	**agat**	at you	**agaibh**

Figures

```
\includegraphics[width=4cm]{Pics/pic.png}
```

Result

Figures

```
\begin{figure}
\centering
\includegraphics[width=4cm]{Pics/pic.png}
\caption{A planning AI simulator prototype}
\label{fig:AI-prototype}
\end{figure}
```
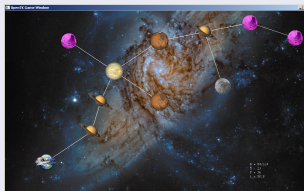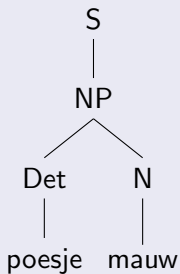
Result

Figure : A planning AI simulator prototype

Graphs with tikz-qtree package

```
\Tree [.S [.NP [.Det poesje ] [.N mauw ] ] ]
```

Result

Code

```
\begin{lstlisting}[language=pascal]
for i:=maxint to 0 do
begin
{ do nothing }
end;
Write('Hello world ');
\end{lstlisting}
```

Result

```
for i:=maxint to 0 do
begin
{ do nothing }
end;
Write('Hello␣world␣');
```

Math - subscripts and superscripts

```
$x^2
x_i
x^2_{i+1}$
```

Result

$x^2 x_i x^2_{i+1}$

Math - Greek letters

```
$\alpha^{\beta_\gamma} + \Omega = \aleph_0$
```

Result

$\alpha^{\beta_\gamma} + \Omega = \aleph_0$

Math - operators

```
$\top \bot \emptyset \exists \forall \neg \|
\cdot \times \div \odot \oplus \dots$
```

Result

⊤ ⊥ ∅ ∃ ∀ ¬ ∥ · × ÷ ⊙ ⊕

Math - operators

```
$\leq \geq \equiv \sim \simeq \models \perp \parallel
    \ll \subset \in \vdash \ni \not< \not\leq \not= \
    not\simeq$
```

Result

$\leq \geq \equiv \sim \simeq \models \perp \parallel \ll \subset \in \vdash \ni \not< \not\leq \neq \not\simeq$

```
$\leftarrow \rightarrow \Leftarrow \Longrightarrow \
    Longleftrightarrow \hookrightarrow$
```

Result
$\leftarrow \rightarrow \Leftarrow \Longrightarrow \Longleftrightarrow \hookrightarrow$

```
$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
```

Result

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

```
$\sqrt [3]{q + \sqrt{ q^2 - p^3 }} + \sqrt [3]{q - \sqrt
    { q^2 - p^3 }}$
```

Result

$$\sqrt[3]{q + \sqrt{q^2 - p^3}} + \sqrt[3]{q - \sqrt{q^2 - p^3}}$$

Math - predefined functions

```
$\cos(\theta + \phi) = \cos \theta \cos \phi - \sin \
    theta \sin \phi$
```

Result

$\cos(\theta + \phi) = \cos \theta \cos \phi - \sin \theta \sin \phi$

```
$\operatorname{arg\,max}_a f(a) = \operatorname*{arg\,
   max}_b f(b)$
```

Result

$\arg\max_a f(a) = \arg\max_b f(b)$

Math - custom functions declaration

```
\DeclareMathOperator*{\argmax}{arg\,max}

$\argmax_c f(c)$
```

Result

$\arg\max_c f(c)$

Math - ellipsis

```
$f(x_1, x_2,\ldots, x_n) = x_1^2 + x_2^2 + \cdots + x_
    n^2$
```

Result

$f(x_1, x_2, \ldots, x_n) = x_1^2 + x_2^2 + \cdots + x_n^2$

```
$\|f\|$
```

Result

$\|f\|$

```
$f(x,y,z) = 3y^2 z \left( 3 + \frac{7x+5}{1 + y^2} \
    right)$
```

Result

$f(x, y, z) = 3y^2 z \left(3 + \frac{7x+5}{1+y^2} \right)$

Math - brackets

```
$\left| 4 x^3 + \left( x + \frac{42}{1+x^4} \right) \right|$
```

Result

$\left| 4x^3 + \left(x + \frac{42}{1+x^4} \right) \right|$

```
$\left. \frac{du}{dx} \right|_{x=0}$
```

Result

$\frac{du}{dx}\big|_{x=0}$

Math - multi-line equations

```
\begin{eqnarray*}
\cos 2\theta & = & \cos^2 \theta - \sin^2 \theta \\
             & = & 2 \cos^2 \theta - 1.
\end{eqnarray*}
```

Result

$$\begin{aligned}
\cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\
&= 2\cos^2 \theta - 1.
\end{aligned}$$

Math - matrices

```
$\left( \begin{array}{ccc}
a & b & c \\
d & e & f \\
g & h & i \end{array} \right)$
```

Result

$$\left(\begin{array}{ccc}
a & b & c \\
d & e & f \\
g & h & i \end{array} \right)$$

Math - systems of equations

```
$ |x| = \left\{ \begin{array}{ll}
        x & \mbox{if $x \geq 0$};\\
        -x & \mbox{if $x < 0$}.\end{array} \right.$
```

Result

$$|x| = \left\{ \begin{array}{ll} x & \text{if } x \geq 0; \\ -x & \text{if } x < 0. \end{array} \right.$$

Math - derivatives

```
$\frac{\partial u}{\partial t}$
```

Result

$\frac{\partial u}{\partial t}$

Math - limits

```
$\lim_{x \to +\infty} \frac{3x^2 +7x^3}{x^2 +5x^4} =
   3$
```

Result

$\lim_{x \to +\infty} \frac{3x^2+7x^3}{x^2+5x^4} = 3$

Math - summations

```
$\sum_{k=1}^n k^2 = \frac{1}{2} n (n+1)$
```

Result

$\sum_{k=1}^n k^2 = \frac{1}{2}n(n+1)$

Math - integrals

```
$\int_a^b f(x)\,dx$
```

Result

$\int_a^b f(x)\,dx$

Bibliography

```
\bibliographystyle{plain}
\bibliography{bibliography}
```

Bibliography

```
@article{LAMBDA_CALCULUS,
    author = {Church, Alonzo},
    journal = {Annals of Mathematics},
    number = {33},
    pages = {346--366},
    posted-at = {2010-10-04 02:27:47},
    priority = {2},
    title = {{A Set of Postulates for the Foundation
        of Logic}},
    url = {http://www.jstor.org/stable/1968337},
    volume = {2},
    year = {1932}
}
```

References

```
As we see in \cite{LAMBDA_CALCULUS}, ...
```

Result

As we see in [1], ...

📄 Alonzo Church.
A Set of Postulates for the Foundation of Logic.
Annals of Mathematics, 2(33):346–366, 1932.