



LaTeX

What you get is what you want

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What is LaTex?

- LaTeX (pronounced “Lay-tech” or “Lah-tech”) is a **typesetting system**.
- Unlike Word, it’s **not a word processor**. You write code that describes your document.
- Ideal for **scientific, technical, or academic documents**.
- Focuses on **structure and content**, formatting is automatic.

LA^TE_X

Why LaTeX over Word?

- **Professional formatting** – automatic numbering, headers, bibliography.
- **Consistency** – headings, captions, references always match.
- **Excellent for math** – formulas, equations, symbols.
- **Scalable** – handles long documents (thesis, books) without breaking layout.
- **Cross-references** – figures, tables, equations auto-update.



VS

LA^TE_X

Where is LaTeX used?

- Academic papers & research journals.
- Thesis, dissertations, and reports.
- Curriculum Vitae (CV) / Resumes.
- Presentations (Beamer slides).
- Books, scientific articles, technical manuals.

Tools to use LaTeX

- **Overleaf** – online LaTeX editor, no installation needed, easy collaboration.
- **TeXLive** – full LaTeX distribution (Windows, Linux, Mac).
- **MiKTeX** – Windows LaTeX distribution.
- **Editors:** TeXstudio, TeXmaker, VSCode + LaTeX extension.



Basic LaTeX Document Structure

```
1 \documentclass{article}
2 \begin{document}
3 % Your content goes here
4 \end{document}
5
```

\documentclass{} → defines the type of document (article, report, book, beamer)

\begin{document} ... \end{document} → everything between these commands is the content of your document.

Adding Title, Author, and Date

```
1 \documentclass{article}
2 \title{Introduction to LaTeX}
3 \author{John Doe}
4 \date{\today}
5 \begin{document}
6 \maketitle
7 \end{document}
```

Editing ▾

Introduction to LaTeX

John Doe

August 25, 2025



Sections and Subsections

The image shows a LaTeX editor interface. On the left, the code editor displays the following LaTeX document:

```
1 \documentclass{article}
2 \title{LaTeX Document}
3 \author{John Doe}
4 \date{\today}
5 \begin{document}
6 \maketitle
7
8 \section{Introduction}
9 This is my first LaTeX document.
10
11 \subsection{Background}
12 LaTeX automatically formats sections.
13 \end{document}
14 |
```

The right side of the interface shows the generated LaTeX document. At the top, there is an "Editing" button with a dropdown arrow, and below it are two circular arrows (one right, one left) and a vertical ellipsis menu.

The document content is as follows:

LaTeX Document
John Doe
August 25, 2025

1 Introduction

This is my first LaTeX document.

1.1 Background

LaTeX automatically formats sections.

Text Formatting in LaTeX

```
1 \documentclass{article}
2 \title{LaTeX Document}
3 \author{John Doe}
4 \date{\today}
5 \begin{document}
6 \maketitle
7
8 \section{Introduction}
9 This is my first LaTeX document.
10
11 \subsection{Text Formatting}
12 This is \textbf{bold}, \textit{italic}, and \underline{underlined} text.
13
14 \end{document}
15
```

Editing ▾

LaTeX Document

John Doe

August 25, 2025

1 Introduction

This is my first LaTeX document.

1.1 Text Formatting

This is **bold**, *italic*, and underlined text.

Text Superscript & Subscripts

```
18 \subsection{Text Formatting}
19 This is \textbf{bold}, \textit{italic},  \underline{underlined} text.
20
21 \subsection{Text Superscripts and Subscripts}
22 x\textsuperscript{th} century
23 H\textsuperscript{+} ion
24
~
```

1.1 Text Formatting

This is **bold**, *italic*, and underlined text.

1.2 Text Superscripts and Subscripts

x^{th} century H^+ ion

Unordered (bullets) Lists

```
1 \documentclass{article}
2 \title{LaTeX Document}
3 \author{John Doe}
4 \date{\today}
5 \begin{document}
6 \maketitle
7
8 \section{Introduction}
9 This is my first LaTeX document.
10
11 \subsection{Text Formatting}
12 This is \textbf{bold}, \textit{italic}, and \underline{underlined} text.
13
14 \subsection{unordered (bullets) list:}
15 \begin{itemize}
16   \item First item
17   \item Second item
18   \item Third item
19 \end{itemize}
20
21
22 \end{document}
```

Editing



1 Introduction

This is my first LaTeX document.

1.1 Text Formatting

This is **bold**, *italic*, and underlined text.

1.2 Unordered (bullets) list:

- First item
- Second item
- Third item

Ordered (numbered) list:

```
15  
14 \subsection{Unordered (bullets) list:  
15 \begin{itemize}  
16   \item First item  
17   \item Second item  
18   \item Third item  
19 \end{itemize}  
20  
21 \subsection{Ordered (numbered) list:  
22 \begin{enumerate}  
23   \item First item  
24   \item Second item  
25   \item Third item  
26 \end{enumerate}  
27  
28 \end{document}  
29
```

Editing

1.2 Unordered (bullets) list:

- First item
- Second item
- Third item

1.3 Ordered (numbered) list:

1. First item
2. Second item
3. Third item

Code Snippets / Verbatim Text

```
27  
28 \subsection{Code Snippets:  
29 \begin{verbatim}  
30 #include <stdio.h>  
31 int main()  
32     printf("Hello, World!\n");  
33     return 0;  
34 }  
35 \end{verbatim}  
36  
37  
38 \end{document}  
39
```

Editing ▾

1.4 Code Snippets:

```
#include <stdio.h>  
int main()  
    printf("Hello, World!\n");  
    return 0;  
}
```

Introduction to Math in LaTeX

LaTeX is widely used for mathematics because it gives:

- Professional, clean equations.
- Precise control over symbols.

Two main modes:

- Inline math → inside text with $\$...$$
- Display math → centered on a new line with $\[...\]$

The screenshot shows a LaTeX editor interface with two panes. The left pane is titled 'Editing' and displays the following LaTeX code:

```
36 \newpage
37 \subsection{Inline Math:}
38 The solution of  $ax^2 + bx + c = 0$  is given by...
39
40 \subsection{Display Math:}
41 [
42   ax2 + bx + c = 0
43 ]
44
45
46
47
48
49 \end{document}
```

The right pane shows the rendered output:

1.5 Inline Math:
The solution of $ax^2 + bx + c = 0$ is given by...

1.6 Display Math:
$$ax^2 + bx + c = 0$$

Superscripts & Subscripts

A screenshot of a LaTeX editor interface. On the left, the code editor shows the following LaTeX code:

```
45
46 \subsection{Superscripts and Subscripts}
47 [
48 E = mc^2, \quad a_i, \quad x_{i}^n
49 ]
50
51
52
53 \end{document}
54
```

The code includes a section header, a brace group, and a mathematical equation with superscripts and subscripts. The editor has a dark theme with light-colored syntax highlighting. On the right, the preview pane displays the rendered output:

1.7 Superscripts and Subscripts:

$$E = mc^2, \quad a_i, \quad x_i^n$$

Fraction & Roots

```
50
51 \subsection{Fraction and Roots:}
52 [
53 \frac{1}{2}, \quad \sqrt{x}, \quad \sqrt[3]{y}
54 ]
55
56
57 | [REDACTED]
58
59 \end{document}
```

Editing ▾

1.8 Fraction and Roots:

$$\frac{1}{2}, \quad \sqrt{x}, \quad \sqrt[3]{y}$$

Greek Letters & Common Symbols

```
56
57 \subsection{Greek Letters and Common Symbols:}
58 \textbf{Greek Letters:}
59
60 \[
61 \alpha, \beta, \gamma, \delta, \omega
62 \]
63
64 \textbf{Common Symbols:}
65
66 \[
67 \infty, \leq, \geq, \rightarrow
68 \]
69
70
71 \end{document}
72
```

Editing ▾

1.9 Greek Letters and Common Symbols: Greek Letters:

$\alpha, \beta, \gamma, \Delta, \Omega$

Common Symbols:

$\infty, \leq, \geq, \rightarrow$

Tables & Figures in LaTeX

- LaTeX provides powerful tools for creating professional tables and including figures.
- Tables: `tabular` environment.
- Figures: `\includegraphics` from the `graphicx` package.
- Supports captions and cross-referencing.

Basic Table

```
69  
70 \section{Tables and Figures} Editing  
71  
72 \subsection{Basic Table}  
73  
74 \begin{tabular}{|c|c|c|}  
75 \hline  
76 Name & Age & Grade \\  
77 \hline  
78 Alice & 20 & A \\  
79 Bob & 22 & B \\  
80 charlie & 21 & A \\  
81 \hline  
82 \end{tabular}  
83  
84 \end{document}  
85
```

2 Tables and Figures

2.1 Basic Table

Name	Age	Grade
Alice	20	A
Bob	22	B
Charlie	21	A

Table Formatting

```
83
84 \subsection{Table Formatting}
85
86 \begin{tabular}{|c|c|c|} 
87 \hline
88 \multicolumn{3}{|c|}{Student Info} \\
89 \hline
90 Name & Age & Grade \\
91 \hline
92 Alice & 20 & A \\
93 Bob & 22 & B \\
94 \hline
95 \end{tabular}
96
97 \end{document}
98
```

Editing

2.2 Table Formatting

Student Info		
Name	Age	Grade
Alice	20	A
Bob	22	B

Adding Figures and Referencing

```
104  
105 \begin{figure}[H]  
106   \centering  
107   \includegraphics[width=0.4\textwidth]  
     {ucsc-image.png}  
   \caption{UCSC}  
   \label{fig:UCSC}  
 \end{figure}  
  
111  
112 As shown in Figure~\ref{fig:UCSC},  
113 we can easily include images in LaTeX.  
  
114  
115  
116  
117 \end{document}  
118
```

2.3 Adding Figures and Referencing



Figure 1: UCSC

As shown in Figure 1, we can easily include images in LaTeX.

Labels & Cross-References

```
115  
116 \section{Referencing and Bibliography}   
117 \subsection{Labels and Cross-References}  
118 \begin{equation}  
119     E = mc^2  
120     \label{eq:energy}  
121 \end{equation}  
122  
123  
124 Einstein's theory of relativity introduced  
one of the most famous equations in physics,  
125 which describes the equivalence of mass and  
energy. This relationship is represented  
126 mathematically in Equation~\ref{eq:energy},  
where energy ( $E$ ) is equal to mass ( $m$ )  
127 multiplied by the speed of light ( $c$ )  
squared. By using a label for the equation,  
we can  
128 easily refer back to it anywhere in the  
document without manually typing the number.  
129 If we later add or remove equations, LaTeX  
will automatically update the numbering,  
130 ensuring that all references to  
Equation~\ref{eq:energy} remain correct and  
consistent.  
131 |
```

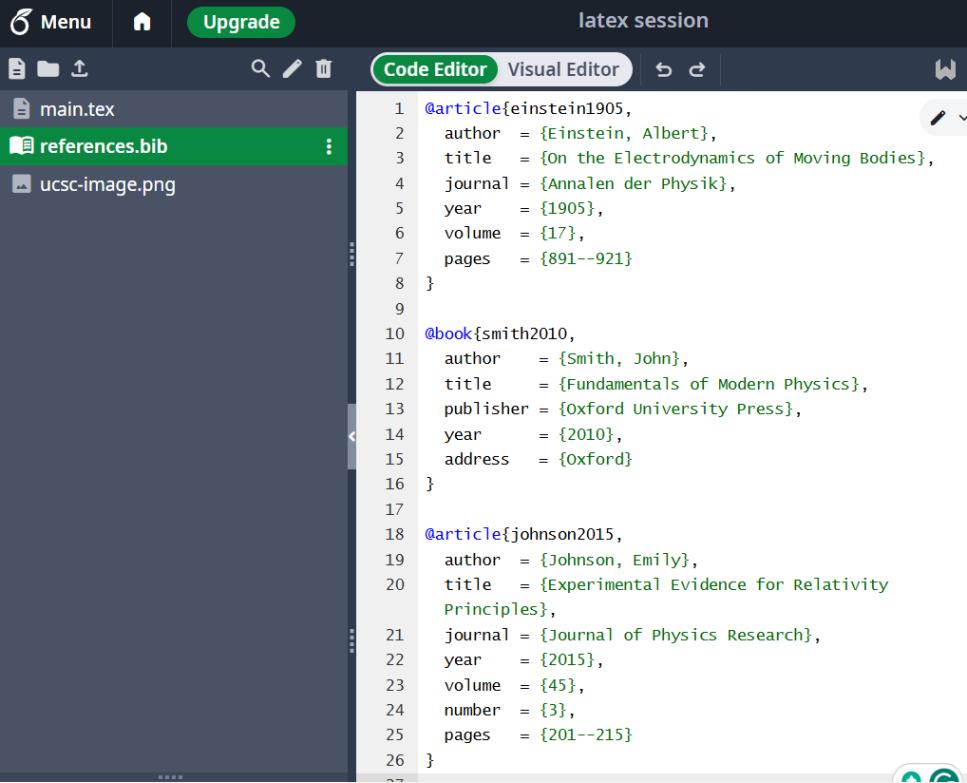
3 Referencing and Bibliography

3.1 Labels and Cross-References

$$E = mc^2 \quad (1)$$

Einstein's theory of relativity introduced one of the most famous equations in physics, which describes the equivalence of mass and energy. This relationship is represented mathematically in Equation 1, where energy (E) is equal to mass (m) multiplied by the speed of light (c) squared. By using a label for the equation, we can easily refer back to it anywhere in the document without manually typing the number. If we later add or remove equations, LaTeX will automatically update the numbering, ensuring that all references to Equation 1 remain correct and consistent.

Labels & Cross-References



The screenshot shows a LaTeX editor interface with a code editor window displaying a BibTeX file named `references.bib`. The file contains three entries: `@article{einstein1905,`, `@book{smith2010,`, and `@article{johnson2015,`. The code editor has a dark theme with syntax highlighting for the BibTeX keywords and values.

```
1 @article{einstein1905,
2   author = {Einstein, Albert},
3   title  = {On the Electrodynamics of Moving Bodies},
4   journal = {Annalen der Physik},
5   year   = {1905},
6   volume = {17},
7   pages  = {891--921}
8 }

9

10 @book{smith2010,
11   author = {Smith, John},
12   title  = {Fundamentals of Modern Physics},
13   publisher = {Oxford University Press},
14   year   = {2010},
15   address = {Oxford}
16 }

17

18 @article{johnson2015,
19   author = {Johnson, Emily},
20   title  = {Experimental Evidence for Relativity Principles},
21   journal = {Journal of Physics Research},
22   year   = {2015},
23   volume = {45},
24   number = {3},
25   pages  = {201--215}
26 }
```

Citations in LaTeX

References

- Einstein, A. (1905), ‘On the electrodynamics of moving bodies’, *Annalen der Physik* 17, 891–921.
- Johnson, E. (2015), ‘Experimental evidence for relativity principles’, *Journal of Physics Research* 45(3), 201–215.
- Smith, J. (2010), *Fundamentals of Modern Physics*, Oxford University Press, Oxford.

Citations in LaTeX

```
133  
134 \subsection{Citations in LaTeX}  
135 \citet{einstein1905} introduced the theory of special  
relativity,  
136 which fundamentally changed the understanding of space and  
time.  
137 Their work demonstrated that energy and mass are  
equivalent,  
138 a principle expressed in the famous equation  $E=mc^2$ .  
139 Subsequent studies have provided strong experimental  
support  
140 for this concept \citet{smith2010, johnson2015},  
141 making it one of the cornerstones of modern physics.  
142  
143  
144 \newpage  
145 \bibliography{references}
```

3.2 Citations in LaTeX

Einstein (1905) introduced the theory of special relativity, which fundamentally changed the understanding of space and time. Their work demonstrated that energy and mass are equivalent, a principle expressed in the famous equation $E = mc^2$. Subsequent studies have provided strong experimental support for this concept (Smith 2010, Johnson 2015), making it one of the cornerstones of modern physics.

Citations in LaTeX

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143  
144 \newpage  
145 \bibliography{references}
```

3.2 Citations in LaTeX

Einstein (1905) introduced the theory of special relativity, which fundamentally changed the understanding of space and time. Their work demonstrated that energy and mass are equivalent, a principle expressed in the famous equation $E = mc^2$. Subsequent studies have provided strong experimental support for this concept (Smith 2010, Johnson 2015), making it one of the cornerstones of modern physics.

Useful Packages

- graphicx (images)
- amsmath (better math)
- geometry (page layout)
- hyperref (clickable links)
- xcolor (colors)