

# MetaDoc LaTeX Example Document

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January 24, 2026

## Abstract

This document demonstrates MetaDoc's complete support for LaTeX, including complex mathematical formulas, tables, charts, code blocks, and other elements. LaTeX is a professional document typesetting system widely used in academic papers, technical reports, and other scenarios.

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# 1 Introduction

This document demonstrates MetaDoc's support for LaTeX. LaTeX is a professional document typesetting system widely used in academic papers, technical reports, and other scenarios. This document will demonstrate the following:

- Complex mathematical formulas and theorem environments
- Professional tables and charts
- Code blocks and algorithm demonstrations
- Multi-column layouts and floating objects
- Cross-references and hyperlinks

## 2 Features

### 2.1 Mathematical Formula Support

MetaDoc supports complete LaTeX mathematical formula syntax, including inline and block-level formulas. For example, the famous mass-energy equation:

**Theorem 2.1** (Einstein's Mass-Energy Equation). *For any object with mass  $m$ , its energy  $E$  satisfies:*

$$E = mc^2 \tag{1}$$

where  $c$  is the speed of light.

### 2.2 Complex Mathematical Expressions

Supports complex mathematical expressions, such as integrals and series: The following are some important mathematical results:

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi} \tag{2}$$

$$\sum_{i=1}^n \frac{1}{i^2} = \frac{\pi^2}{6} \tag{3}$$

$$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e \tag{4}$$

**Proposition 2.2** (Gaussian Integral). *Equation (2) is known as the Gaussian integral and has important applications in probability theory and statistics.*

## 2.3 Matrix Operations

Supports matrix representation and operations:

$$\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix} = \begin{pmatrix} \sum_{j=1}^n a_{1j}x_j \\ \sum_{j=1}^n a_{2j}x_j \\ \vdots \\ \sum_{j=1}^n a_{mj}x_j \end{pmatrix} \quad (5)$$

## 2.4 Complex Table Example

Table 1 demonstrates a complex table:

Table 1: Complex Table Example

Category	2023		2024	
	Count	Share	Count	Share
Category A	120	30%	150	35%
Category B	180	45%	200	47%
Category C	100	25%	80	18%

## 2.5 Code Example

The following is a Python code example:

Listing 1: Example Code

```
def fibonacci(n):
    """Calculate the nth Fibonacci number"""
    if n <= 1:
        return n
    a, b = 0, 1
    for _ in range(2, n + 1):
        a, b = b, a + b
    return b

# Usage example
for i in range(10):
    print(f"F({i})={fibonacci(i)}")
```

## 2.6 Algorithm Example

The following is an algorithmic pseudocode example:

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**Algorithm 1** QuickSort Algorithm

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**Require:** Array  $A[1..n]$

**Ensure:** Sorted array

1: **if**  $n \leq 1$  **then**

2:   **return**  $A$

3: **end if**

4: Choose pivot element  $pivot = A[\lfloor n/2 \rfloor]$

5: Partition  $A$  into three parts:  $L = \{x|x < pivot\}$ ,  $E = \{x|x = pivot\}$ ,  $R = \{x|x > pivot\}$

6: **return** QuickSort( $L$ ) +  $E$  + QuickSort( $R$ )

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## 2.7 Graphics Drawing Example

A graphics example drawn using TikZ:

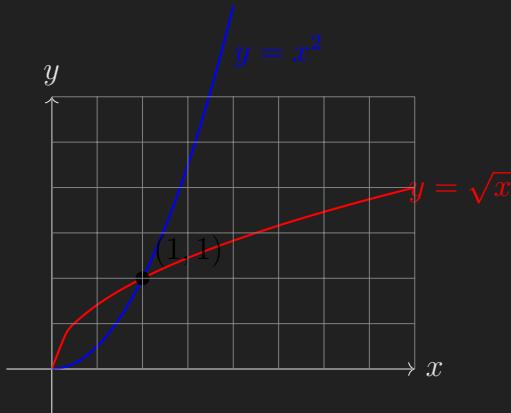


Figure 1: Function Plot Example:  $y = x^2$  and  $y = \sqrt{x}$

## 2.8 Multi-column Layout Example

Here is an example of a multi-column layout:

### Content of Column One:

LaTeX is a professional document typesetting system developed by Leslie Lamport. It is based on the TeX typesetting system and provides higher-level commands for document structure.

### Content of Column Two:

MetaDoc offers full LaTeX support, including syntax highlighting, real-time preview, and auto-completion, enabling you to efficiently write LaTeX documents.

## 2.9 Physics Formula Example

Here are some physics formula examples:

$$\vec{F} = m\vec{a} \tag{6}$$

$$E = \frac{1}{2}mv^2 + mgh \tag{7}$$

$$\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \tag{8}$$

Equation (6) is Newton's second law, Equation (7) is the mechanical energy formula, and Equation (8) is one of Maxwell's equations.

## 2.10 Chemistry Formula Example

Here are some chemistry formula examples:

- Water molecule  $\text{H}_2\text{O}$
- Carbon dioxide  $\text{CO}_2$
- Chemical reaction  $\text{2H}_2 + \text{O}_2 \longrightarrow \text{2H}_2\text{O}$
- Equilibrium reaction  $\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$

## 2.11 More Math Environments

**Definition 2.3** (Continuous Function). *Let a function  $f : \mathbb{R} \rightarrow \mathbb{R}$ . If for any  $x_0 \in \mathbb{R}$ , we have*

$$\lim_{x \rightarrow x_0} f(x) = f(x_0)$$

*then  $f$  is said to be continuous at  $x_0$ .*

**Lemma 2.4** (Mean Value Theorem). *If a function  $f$  is continuous on the closed interval  $[a, b]$  and differentiable on the open interval  $(a, b)$ , then there exists some  $c \in (a, b)$  such that*

$$f'(c) = \frac{f(b) - f(a)}{b - a}$$

**Example 2.5.** Consider the function  $f(x) = x^2$  on the interval  $[0, 2]$ . According to the Mean Value Theorem, there exists  $c \in (0, 2)$  such that

$$f'(c) = 2c = \frac{f(2) - f(0)}{2 - 0} = \frac{4 - 0}{2} = 2$$

Thus  $c = 1$ .

### 3 Conclusion

MetaDoc provides complete LaTeX editing and compilation support, allowing you to easily create professional academic documents. This document demonstrates:

- i. Use of theorem environments (see Equation (1) and Figure 1)
- ii. Complex mathematical formulas (see Equations (5) and (6))
- iii. Table and code block presentations (see Table 1 and Algorithm 1)
- iv. Cross-reference and hyperlink functionality
- v. TikZ graphics drawing
- vi. Multi-column layout and floating objects
- vii. Physics and chemistry formulas

**Corollary 3.1.** *MetaDoc provides complete LaTeX editing and compilation support, allowing you to easily create professional academic documents.*

## References

- [1] Einstein, A. (1905). *On the Electrodynamics of Moving Bodies*. Annalen der Physik, 17(10), 891-921.
- [2] Gauss, C. F. (1809). *Theoria Motus Corporum Coelestium*. Hamburg: Perthes et Besser.