MetaDoc LaTeX Example Document

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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.

Contents

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:

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

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

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

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:

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

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:

Algorithm 1 QuickSort Algorithm

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)

2.7 Graphics Drawing Example

A graphics example drawn using TikZ:

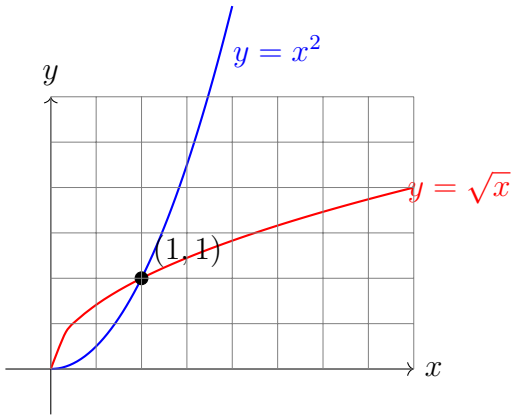

Figure 1: Function Plot Example: $y = x^2$ and $y = \sqrt{x}$

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 H_2O
- Carbon dioxide CO_2
- Chemical reaction ${}_2H_2 + O_2 \longrightarrow {}_2H_2O$
- Equilibrium reaction $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$

2.11 More Math Environments

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

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

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.