LaTeX 公式输入

ChinaTeX 在线培训课程

主讲：方杰

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演讲内容

行内、行间公式

- 行内公式：`$...$`
- 行间公式：`$$...$$` 或者 `\[...\]`

The quick brown fox $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ jumps over the lazy dog. The quick brown fox jumps over the lazy dog.

The quick brown fox

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

jumps over the lazy dog. The quick brown fox jumps over the lazy dog.

示例 1：行内公式

The quick brown fox $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ jumps over the lazy dog. The quick brown fox jumps over the lazy dog.

```
The quick brown fox
$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
 jumps over the lazy dog. The quick brown
fox jumps over the lazy dog.
```

示例 2：行间公式

The quick brown fox

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

jumps over the lazy dog. The quick brown fox jumps over the lazy dog.

```
The quick brown fox
$$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$
 jumps over the lazy dog. The quick brown
fox jumps over the lazy dog.
```

示例 3

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

问题：如何使得分子中的字母不会缩小？

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$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

使用命令`\displaystyle`

示例 3(cont.)

$$d_1=\frac{\ln\left(\frac{S}{X}\right)+\left(r+\frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

```
\[d_1=\frac{\ln\left(\displaystyle\frac{S}
{X}\right)+\left(r+\displaystyle
\frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}\]
```

示例 4：上下标位置问题

行间公式下：

$$A = \sum_{n=1}^{5} n^2$$

行内公式下：$A = \sum_{n=1}^{5} n^2$

问题：如何实现行内公式与行间公式上下标位置的转换？

示例 4：上下标位置问题

行间公式下：

$$A = \sum_{n=1}^{5} n^2$$

行内公式下：$A = \sum_{n=1}^{5} n^2$

问题：如何实现行内公式与行间公式上下标位置的转换？

`\limits`	右侧 $\rightarrow$ 上下
`\nolimits`	上下 $\rightarrow$ 右侧

示例 4：上下标位置问题 (cont.)

$$A=\sum_{n=1}^{5}n^2$$

```
$$A=\sum\nolimits^5_{n=1}n^2$$
```

The quick brown fox $A=\sum_{n=1}^{5}n^2$ jumps over the lazy dog. The quick brown fox jumps over the lazy dog. The quick brown fox jumps over the lazy dog.

```
$A=\sum\limits^5_{n=1}n^2$
```

公式的编号方法

- 自动编号：

```
\begin{equation}
...
\end{equation}
```

- 标签：\tag

```
\begin{equation}\tag{...}
    eq.
\end{equation}
```

- 以节为依据进行编号：

```
\numberwithin{equation}{section}
```

- 子编号：

```
\begin{subequations}
\begin{equation}
    ...          (eq. a)
\end{equation}
\begin{equation}
    ...          (eq. b)
\end{equation}
\end{subequations}
```

常见宏包

- amsmath 宏包
- 字体宏包
  - mathrsfs 和 amsfonts 宏包
  - bm 宏包：字体加粗
  - mathptmx 宏包、fourier 宏包.....

mathrsfs 和 amsfonts 宏包

- \mathscr

$\mathscr{A}\mathscr{B}\mathscr{C}\mathscr{D}\mathscr{E}\mathscr{F}\mathscr{G}\mathscr{H}\mathscr{I}\ \mathscr{J}\mathscr{K}\mathscr{L}\mathscr{M}\mathscr{N}\mathscr{O}\mathscr{P}\mathscr{Q}\mathscr{R}\mathscr{S}\mathscr{T}$

- \mathcal

$\mathcal{ABCDEFGHIJKLMNOPQRST}$

- \mathbb

$\mathbb{ABCDEFGHIJKLMNOPQRST}$

- \mathfrak

$\mathfrak{ABCDEFGHIJKLMNOPQRST}$

bm 宏包

可用于字体的加粗

$$\boldsymbol{x},\ \boldsymbol{X},\ \boldsymbol{\alpha},\ \boldsymbol{\Theta};\qquad x,\ X,\ \alpha,\ \Theta$$

$$\boldsymbol{x^2+y^2=z^2};\qquad x^2+y^2=z^2$$

另一种形式的粗体：使用\mathbf 命令

$$\mathbf{x},\mathbf{y};\quad \mathbf{X},\mathbf{Y}$$

公式的环境

- 矩阵环境：`array`, `matrix`, `Bmatrix`, `bmatrix`, `pmatrix`, `vmatrix`, `Vmatrix`,
- 分段函数环境：`cases`
- 公式对齐环境：`split`, `align`, `eqnarray`, `gathered`

矩阵环境 1

$$\left[\begin{matrix}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{matrix}\right]$$

```
\[\left[\begin{matrix}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{matrix}\right]\]
```

$$\left[\begin{array}{ccc}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{array}\right]$$

```
\[\left[\begin{array}{ccc}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{array}\right]\]
```

矩阵环境 2

$$\begin{Bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{Bmatrix}$$

```
\[\begin{Bmatrix}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{Bmatrix}\]
```

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

```
\[\begin{bmatrix}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{bmatrix}\]
```

矩阵环境 3

$$\begin{Vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{Vmatrix}$$

```
\[\begin{Vmatrix}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{Vmatrix}\]
```

$$\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

```
\[\begin{vmatrix}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{vmatrix}\]
```

矩阵环境 4

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

```
\[\begin{pmatrix}
1 & 2& 3\\
4 & 5& 6\\
7 & 8& 9
\end{pmatrix}\]
```

分段函数环境

$$I_A(x) = \begin{cases} 1, & x \in A \\ 0, & x \notin A \end{cases}$$

```
\[I_{A}(x)=\begin{cases}
1, &  x\in A\\
0, &  x\not\in A
\end{cases}\]
```

公式对齐问题

糟糕的排版：

$$(a+b)^4 = (a+b)^2(a+b)^2 = (a^2+2ab+b^2)(a^2+2ab+b^2) = a^4+$$

公式对齐问题

糟糕的排版：

$$(a+b)^4 = (a+b)^2(a+b)^2 = (a^2+2ab+b^2)(a^2+2ab+b^2) = a^4+$$

目标：

$$\begin{aligned}(a+b)^4 &= (a+b)^2(a+b)^2 \\ &= (a^2+2ab+b^2)(a^2+2ab+b^2) \\ &= a^4+4a^3b+6a^2b^2+4ab^3+b^4\end{aligned}$$

公式对齐环境 split

$$\begin{aligned}(a+b)^4 &= (a+b)^2(a+b)^2 \\ &= (a^2+2ab+b^2)(a^2+2ab+b^2) \\ &= a^4+4a^3b+6a^2b^2+4ab^3+b^4\end{aligned}$$

```
\[\begin{split}
(a+b)^4&=(a+b)^2(a+b)^2\\
&=(a^2+2ab+b^2)(a^2+2ab+b^2)\\
&=a^4+4a^3b+6a^2b^2+4ab^3+b^4
\end{split}\]
```

公式对齐环境 align

带编号的公式对齐

$$
\begin{aligned}
(a+b)^4 &= (a+b)^2(a+b)^2 \\
&= (a^2+2ab+b^2)(a^2+2ab+b^2) && (1)\\
&= a^4+4a^3b+6a^2b^2+4ab^3+b^4 && (2)
\end{aligned}
$$

```
\begin{align}
(a+b)^4&=(a+b)^2(a+b)^2\nonumber\\
&=(a^2+2ab+b^2)(a^2+2ab+b^2)\\
&=a^4+4a^3b+6a^2b^2+4ab^3+b^4
\end{align}
```

公式对齐环境 eqnarray

使用公式矩阵实现对齐效果

$$\begin{aligned}(a+b)^4 &= (a+b)^2(a+b)^2 \\ &= (a^2+2ab+b^2)(a^2+2ab+b^2) \qquad (3)\\ &= a^4+4a^3b+6a^2b^2+4ab^3+b^4 \qquad (4)\end{aligned}$$

```
\begin{eqnarray}
(a+b)^4&=&(a+b)^2(a+b)^2\nonumber\\
&=&(a^2+2ab+b^2)(a^2+2ab+b^2)\\
&=&a^4+4a^3b+6a^2b^2+4ab^3+b^4
\end{eqnarray}
```

公式对齐环境 gathered

$$
\begin{gathered}
(a+b)^4=(a+b)^2(a+b)^2\\
=(a^2+2ab+b^2)(a^2+2ab+b^2)\\
=a^4+4a^3b+6a^2b^2+4ab^3+b^4
\end{gathered}
$$

```
\[\begin{gathered}
(a+b)^4=(a+b)^2(a+b)^2\\
=(a^2+2ab+b^2)(a^2+2ab+b^2)\\
=a^4+4a^3b+6a^2b^2+4ab^3+b^4
\end{gathered}\]
```

定理宏包

- amsthm 宏包
- ntheorem 宏包

定理环境的设置

```
\newtheorem{thm}{Theorem}[chapter]
\newtheorem{defn}{Definition}
\newtheorem{lemma}[thm]{Lemma}
```

定理环境的设置

```
\newtheorem{thm}{Theorem}[chapter]
\newtheorem{defn}{Definition}
\newtheorem{lemma}[thm]{Lemma}
```

Theorem 2.1. *This is a theorem env.*

Definition 1. *This is a definition env.*

Lemma 2.2. *This is a lemma env.*

Theorem 2.3. *This is also a theorem env.*

Definition 2. *This is also a definition env.*

Lemma 2.4. *This is also a lemma env.*

定理的样式

```
\theoremstyle{plain}
\theoremstyle{definition}
\theoremstyle{remark}
```

Theorem 2.1. *This is a theorem env.*

Definition 1. This is a definition env.

Lemma 2.2. This is a lemma env.

证明环境及名称修改

proof 环境

Proof. The quick brown fox jumps over the lazy dog. □

证明结尾符号\qed

```
\renewcommand{\proofname}{证明}
```

证明. The quick brown fox jumps over the lazy dog. □

证明字体修改

```
\renewcommand{\proofname}{\sffamily Proof}
```

字体修改的相关命令有：

```
\upshape  \bfseries  \rmfamily
\slshape  \mdseries  \sffamily
\itshape             \ttfamily
\scshape
```

谢谢观赏！

JamesFang

Major: Financial Engineering

Administrator of ChinaTEX.org

Using LATEX since 2008.