

Understanding Algebra

A Tutorial on Using LaTeX for Common Expressions and Symbols

LaTeX is a powerful typesetting system widely used for mathematical and scientific documents. This tutorial will cover how to use LaTeX to write the most common expressions and symbols, along with examples.

1. Text Formatting

- **Bold Text:** `\textbf{text}` produces **text**.
- **Italic Text:** `\textit{text}` produces *text*.
- **Underline Text:** `\underline{text}` produces text.

Examples:

```
\textbf{Bold Text}
```

```
\textit{Italic Text}
```

```
\underline{Underline Text}
```

2. Mathematical Expressions

Mathematical expressions can be included in the text or displayed separately.

- **Inline Math:** Use `$...$` for inline expressions. For example, $a^2 + b^2 = c^2$ is written as `$a^2 + b^2 = c^2$`.
- **Displayed Math:** Use `$$...$$` or `\[...\]` for displayed equations. For example,

$$E = mc^2$$

is written as $E = mc^2$ or $\left[E = mc^2 \right]$.

Examples:

Inline: $a^2 + b^2 = c^2$

Displayed: $\left[E = mc^2 \right]$

3. Common Mathematical Symbols

- **Greek Letters:**

- α : `\alpha`

- β : `\beta`

- γ : `\gamma`

- π : `\pi`

- **Operations:**

- $+$: `+`

- $-$: `-`

- \times : `\times`

- \div : `\div`

- **Relations:**

- $=$: `=`

- \neq : `\neq`

- \leq : `\leq`

- \geq : `\geq`

- **Fractions:**

$$\frac{a}{b}$$

is written as `\frac{a}{b}`.

- **Square Roots:**

$$\sqrt{x}$$

is written as `\sqrt{x}`.

Examples:

Greek letters: `\alpha`, `\beta`, `\gamma`, `\pi`

Operations: `+`, `-`, `\times`, `\div`

Relations: `=`, `\neq`, `\leq`, `\geq`

Fractions: `\frac{a}{b}`

Square roots: `\sqrt{x}`

4. Matrices and Arrays

- **Matrix:**

$$\begin{matrix} a & b \\ c & d \end{matrix}$$

is written as:

```
\begin{matrix}
a & b \\
c & d
\end{matrix}
```

- **Array with Brackets:**

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

is written as:

```
\begin{bmatrix}
a & b \\
c & d
\end{bmatrix}
```

5. Aligning Equations

To align multiple equations, use the `align` environment:

```
\begin{align}
a + b &= c \\
d - e &= f
\end{align}
```

This produces:

$$a + b = c \tag{1}$$

$$d - e = f \tag{2}$$

6. Summation and Integration

- **Summation:**

$$\sum_{i=1}^n i$$

is written as `\sum_{i=1}^n i`.

- **Integration:**

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

is written as `\int_{a}^b f(x) dx`.

Examples:

Summation: `\sum_{i=1}^n i`

Integration: `\int_{a}^b f(x) dx`

7. Subscripts and Superscripts

- **Subscripts:** x_i is written as `x_i`.
- **Superscripts:** x^2 is written as `x^2`.

- **Both:** x_i^2 is written as `x_i^2`.

Examples:

Subscripts: `x_i`

Superscripts: `x^2`

Both: `x_i^2`

8. Special Functions

- **Trigonometric Functions:**

– $\sin x$: `\sin x`

– $\cos x$: `\cos x`

– $\tan x$: `\tan x`

- **Logarithms and Exponentials:**

– $\log x$: `\log x`

– e^x : `e^x`

Examples:

Trigonometric functions: `\sin x`, `\cos x`, `\tan x`

Logarithms and exponentials: `\log x`, `e^x`

9. Accents

- \hat{x} : `\hat{x}`

- \bar{y} : `\bar{y}`

- \tilde{z} : `\tilde{z}`

Examples:

Accents: `\hat{x}`, `\bar{y}`, `\tilde{z}`

This tutorial provides a basic overview of using LaTeX for common mathematical expressions and symbols. Practice these commands to become proficient in writing mathematical documents with LaTeX.