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Mathematical expressions

The feature that makes LaTeX the right edition tool for scientific documents is the ability to render complex mathematical expressions. This article explains the basic commands to display equations.

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- 2 Mathematical modes
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- 4 Further Reading

Introduction

Basic equations in LaTeX can be easily "programmed", for example:

```
The well known Pythagorean theorem \(x^2 + y^2 = z^2\) was
proved to be invalid for other exponents.
Meaning the next equation has no integer solutions:

\[ x^n + y^n = z^n \]
```

The well known Pythagorean theorem $x^2 + y^2 = z^2$ was proved to be invalid for other exponents. Meaning the next equation has no integer solutions:

$$x^n + y^n = z^n$$

As you see, the way the equations are displayed depends on the delimiter, in this case `\[ \]` and `\( \)`.

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Mathematical modes

LaTeX allows two writing modes for mathematical expressions: the **inline** mode and the **display** mode. The first one is used to write formulas that are part of a text. The second one is used to write expressions that are not part of a text or paragraph, and are therefore put on separate lines.

Let's see an example of the **inline** mode:

```
In physics, the mass-energy equivalence is stated
by the equation $E=mc^2$, discovered in 1905 by Albert Einstein.
```

In physics, the mass-energy equivalence is stated by the equation $E = mc^2$, discovered in 1905 by Albert Einstein.

To put your equations in *inline* mode use one of these delimiters: `\( \)`, `$ $` or `\begin{math} \end{math}`. They all work and the choice is a matter of taste.

The *displayed* mode has two versions: numbered and unnumbered.

```
The mass-energy equivalence is described by the famous equation

$$E=mc^2$$

discovered in 1905 by Albert Einstein.
In natural units ($c$ = 1), the formula expresses the identity

\begin{equation}
E=m
\end{equation}
```

The mass-energy equivalence is described by the famous equation

$$E = mc^2$$

discovered in 1905 by Albert Einstein. In natural units ($c = 1$), the formula expresses the identity

$$E = m \tag{1}$$

To print your equations in *display* mode use one of these delimiters: `\[ \]`, `$$ $$`, `\begin{displaymath} \end{displaymath}` or `\begin{equation} \end{equation}`

Important Note: *`equation*` environment is provided by an external package, consult the **amsmath** article.*

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Reference guide

Below is a table with some common maths symbols. For a more complete list see the List of Greek letters and math symbols:

description	code	examples
Greek letters	`\alpha \beta \gamma \rho \sigma \delta \epsilon`	$\alpha \beta \gamma \rho \sigma \delta \epsilon$
Binary operators	`\times \otimes \oplus \cup \cap`	$\times \otimes \oplus \cup \cap$
Relation operators	`< > \subset \supset \subseteq \supseteq`	$< > \subset \supset \subseteq \supseteq$
Others	`\int \oint \sum \prod`	$\int \oint \sum \prod$

Different classes of mathematical symbols are characterized by different formatting (for example, variables are itzlized, but operators are not) and different spacing.

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Further Reading

The mathematics mode in LaTeX is very flexible and powerful, there is much more that can be done with it:

- Subscripts and superscripts
- Brackets and Parentheses
- Fractions and Binomials
- Aligning Equations
- Operators
- Spacing in math mode
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- Mathematical fonts