

Mathematics in L^AT_EX

T_EX was written with math as a speciality. Mathematics can be displayed in two forms: inline and block (or display). Math mode uses a different font (similar to the text italic) with totally different spacing between its characters. Within a paragraph, math mode is entered surrounded with dollar signs. For example, $x^2 + y^2 = z^2$ will display $x^2 + y^2 = z^2$. As you can see, simple math is very easy.

The other way to display math is in block mode. Unfortunately, there are many not-necessarily-consistent environments for doing this, and often the older/uglier methods are given as examples before the newer, more convenient ones. My rule-of-thumb: always use the `amsmath` package, and always use the `align` environment. My reasoning: you can do anything with the `align` environment combined with the `split` environment—all other environments provide either the same or lesser functionality.¹ See the second math example document for full demonstrations of those two environments.

That said, the `\[...\]` environment is a nice shorthand, which allows a single line of displayed math without an equation number.

Basics

All of these will work in inline mode also, sometimes with different spacing. c.f. $\frac{A}{B}$ with the fraction example below.

Subscripts and superscripts: $x^y + y_z + a^{b+c} + d_{e+f} + j_l^k$

Fractions: $\frac{A}{B} \quad \frac{A \times B}{C \times D}$

(Note the multiplication symbol: $\times = \text{\times}$)

Brackets: $f\{x\} = x \cdot (y + z) = [x \cdot y + x \cdot z]$

Preceded with the `\left` and `\right` commands, delimiters—`()`, `[]`, `\{}`, `|`, etc.—are resized automatically to best fit:

Large brackets: $\left(\sum_{i=0}^n \left\{ \begin{matrix} x_i \\ y_i \end{matrix} \right\} \right)$

¹With one notable exception (of which I know): there is no way to right align a single line, as in the `multline` env.

Greek letters: $\alpha\beta\gamma\cdots\chi\psi\omega$ $\Gamma\Delta\Theta\Lambda\Xi\Pi\Sigma\Phi\Psi\Omega$

Integrals: $\int_0^\infty x dx$, $\iint xy dA$, $\iiint xyz dV$

`\mathrm{d}` is used to change the font of the ‘d’ symbol to upright roman, which is proper for this case because it is not a variable. Notice how limits on the integrals are simply sub- and super-scripts.

Derivatives: $\frac{dy}{dx}$, $\frac{\partial y}{\partial x}$

Other functions: $\sin(n\pi)$ $\sqrt{x+y}$ $\lim_{x \rightarrow 0} x$ $\sum_{i=0}^n x_i$

There is a huge amount that can be done in math mode, and this document is only the most brief of introductions. Refer to Herbert Voss’s `mathmode.pdf` for a very comprehensive reference, as well as the `amsmath` documentation and the various beginners guides.

For the definitive reference of symbols that you can use, refer to “The Comprehensive L^AT_EX Symbol List”. You can get it from:
<http://www.ctan.org/tex-archive/info/symbols/comprehensive/>

The next example math document illustrates the `align` and `split` environments, followed by a document on arrays and matrices.