LaTeX Questions and Examples

How can I put formatting in text?

LaTeX supports plenty of text formatting capabilities: for example, text can be *emphasized* or **bold** or in SMALL CAPS. Text can also be made bigger or smaller. You can even switch to a sans-serif or `typewriter` font face. This document uses the mathpple package to make Palatino its serifed font rather than the default Computer Modern. Other packages are available to switch to different font families: times, for example, changes the default font to Adobe Times. ∎

How do I write math and equations?

LaTeX supports two general categories of math environments. The first is *inline* math, which stays in the line of the text and is accessed with `\( y \)` or, more commonly, `$z$` to produce y and z. The other type of math environment is *display* math, in which the math is displayed on its own separate line. For a display math environment without any equation numbering, write `\[ (your math here) \]` to produce something set like

$$\sin \alpha \cos \beta + \sin \beta \cos \alpha = \sin(\alpha + \beta).$$

The above equation also demonstrates that LaTeX recognizes special functions such as sin and tan and det as well as the characters of the Greek alphabet. In most cases, the command name is simply the name of the function or letter. LaTeX also has commands for many different mathematical symbols and constructs, such as fractions, integrals, radicals, sums, and products, so it's easy to write expressions such as

$$\Lambda(a, \gamma) = \sqrt{\sum_{n=1}^{\infty} \left(\frac{1}{2} \prod_{k=1}^{n} \int_{\sqrt[5]{a}}^{\arctan \gamma} x^{-k} \, dx \right)}$$

∎

What if I want to refer to an equation somewhere else in my text?

If you want to refer to an equation later, use the `equation` environment and include a `\label` command. For example, the famous *class equation* from abstract algebra states that, for a finite group G,

$$|G| = |Z(G)| + \sum_{i=1}^{r} |G : C_G(g_i)|. \tag{1}$$

To refer to the equation later, use the `\ref` command: Equation 1 is one classy equation. The `\label`-`\ref` syntax allows references to many other LaTeX structures, such as sectioning commands, tables, and figures. ∎

How do I get displayed equations to line up?

To align equations, use the amsmath package's `align` environment, like so:

$$3x + 4y = 8 \tag{2}$$
$$6x + y = 12 \tag{3}$$

If you don't want the equations numbered, use `align*`. ∎

How do I make a matrix and other matrix-like things?

Although you can use the `array` environment with automatically sizing delimiters to make matrices, amsmath provides matrix environments that are much easier to use:

$$\begin{pmatrix} 1 & 0 \end{pmatrix} \begin{pmatrix} 1 & 0 & 2 \\ 3 & -3 & 5 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 2 \end{pmatrix}$$

The above matrices use `pmatrix`, but if you prefer brackets, use `bmatrix`. For determinants, use `vmatrix`. The amsmath package also provides a `cases` environment for case-by-case definitionS:

$$f(x) = \begin{cases} 1 & x > 0, \\ 0 & x \le 0. \end{cases}$$

∎

What about putting boxes around solutions?

If you want to box something in text, use the `\fbox` command, $\boxed{\text{like this.}}$ The amsmath package provides the `\boxed` command for math-mode boxing:

$$J(z) = \frac{1}{2}\left(e^{i\theta} + e^{-i\theta}\right) = \boxed{\cos\theta.}$$

If you need to make an empty box of a particular size, pass the desired width of the box as the optional argument to `\framebox` and put a zero-width `\rule` of the desired height inside the box. Thus, the command `\framebox[1in]{\rule{0pt}{1cm}}` creat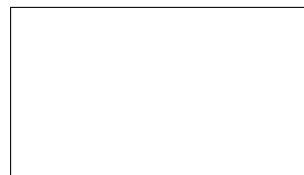es a box one inch wide and one cm tall[1]: If you want to make these boxes "display-set," put them in a centered `tabular` environment, like so:

part (a)   part (b)   part (c)

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[1] Actually, because of the internal padding in a framebox, the specified box will be slightly taller than the height you specify.

The `tabular` environment then also makes it easy to add a small caption for each box. ∎

| Where else can I go for help on LaTeX? |

A lot of information on LaTeX is available online, including many tutorials and example documents as well as documentation for packages.

- The Math Dept hosts a tips-and-tricks document as well as links to several useful online references and to a list of recommended books at `http://www.math.hmc.edu/computing/support/tex/`. Another useful departmental site is the sample thesis page, `http://www.math.hmc.edu/seniorthesis/tools/samplethesis/`.

- A popular tutorial is The Not So Short Introduction to LaTeX 2_ε, available in PDF format at `http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf`.

- If you're looking for documentation on a particular package, it may be available in the `doc/latex/` directory of your TeX installation.

Also, plenty of people on campus use LaTeX themselves, so try asking around for help. In addition, you may wish to subscribe to the HMC LaTeX mailing list, `latex-l@hmc.edu`. ∎