Commonly-Used LaTeXCommands

This reference document summarizes LaTeXcommands that are often used, especially for mathematics, though limited to what is most used in scientific papers.

Type: Fonts and Size

The standard font is "roman", which if you needed it would be gotten with the `\textrm{...}` command; the others that you might need are: *italic* (`\textit{...}`), **boldface** (`\textbf{...}`), sans-serif (`\textsf{...}`), SMALL CAPS (`\textsc{...}`), and typewriter (`\texttt{...}`).

The size for most of the text is set in the `documentclass` command; the sizes relative to this are: tiny, scriptsize, footnotesize, small, normalsize, large, Large, LARGE, huge, and Huge.

E.g., you would use the command `\tiny{tiny type}` to get some tiny type.

Units and Spaces (Text and Math Mode)

LaTeXunits include the familiar `cm` and `in`, and the typographer's units `pt` (points, about 72 per inch) and `pc` (picas, 12 per point). Spaces between words and letters are given in ems, which scale with the type size. In math mode, forced horizontal spaces (not usually needed) are `\,` (||), `\:` (||), `\;` (| |), `\ ` (| |), `\quad` (| |), and `\qquad` (| |). The `\,` is also available in text mode.

Symbols and Accents (Text Mode)

#	`\#`	$	`\$`	_	`\_`	{	`\{`	}	`\}`	&	`\&`
%	`\%`	¿	`?‘`	¡	`!‘`	§	`\S`	¶	`\P`	†	`\dag`
‡	`\ddag`	‰	`\permil`	✓	`\checked`	☽	`\rightmoon`	€	`\euro`	£	`\pounds`
ō	`\-{o}`	o̧	`\c{o}`	ó	`\'{o}`	ò	`\‘{o}`	ö	`\"{o}`	ő	`\H{o}`
o̅	`\={o}`	o̲	`\b{o}`	ô	`\^{o}`	ȯ	`\.{o}`	ọ	`\d{o}`	ŏ	`\v{o}`

The ‰, ☽, and ✓ symbols require the package wasysym; the € symbol requires eurofont.

Greek (Math Mode)

α	`\alpha`	β	`\beta`	γ	`\gamma`	δ	`\delta`	ϵ	`\epsilon`	ε	`\varepsilon`
ζ	`\zeta`	η	`\eta`	θ	`\theta`	κ	`\kappa`	λ	`\lambda`	μ	`\mu`
ν	`\nu`	ξ	`\xi`	π	`\pi`	ρ	`\rho`	σ	`\sigma`	τ	`\tau`
ϕ	`\phi`	φ	`\varphi`	χ	`\chi`	ψ	`\psi`	ω	`\omega`		
Γ	`\Gamma`	Δ	`\Delta`	Θ	`\Theta`	Λ	`\Lambda`	Ξ	`\Xi`	Π	`\Pi`
Σ	`\Sigma`	Υ	`\Upsilon`	Φ	`\Phi`	Ψ	`\Psi`	Ω	`\Omega`		

Variant forms include ϑ, ϖ, and ς; $\imath$ and υ are easily confused with roman letters.

Accents, Superscripts, Subscripts (Math Mode)

90°	`90^{\circ}`	x'	`x^{\prime}`	$\bar{x}$	`\bar{x}`	$\hat{x}$	`\hat{x}`	$\tilde{x}$	`\tilde{x}`	$\vec{x}$	`\vec{x}`
$\dot{x}$	`\dot{x}`	$\ddot{x}$	`\ddot{x}`	$\acute{x}$	`\acute{x}`	$\grave{x}$	`\grave{x}`	$\breve{x}$	`\breve{x}`	$\check{x}$	`\check{x}`
x_1	`x_1`	x^2	`x^2`	x_1^2	`x_1^2`	x_2^1	`x^1_2`	${}_0S_2$	`_0S_2`	${}_j^iX_l^k$	`^i_jX^k_l`

Functions (Math Mode)

The following names, if preceded by a \, will print as roman in math mode; for example, `\sin` prints as sin, rather than *sin*.

ln log exp sin cos tan cot sec csc arcsin arccos arctan
sinh cosh tanh coth ker max min sup inf Pr arg det lim

Symbols (Math Mode)

$\neq$	\neq	$\leq$	\le	$\geq$	\ge	$\ll$	\ll	$\gg$	\gg	$\sim$	\sim
$\doteq$	\doteq	$\simeq$	\simeq	$\approx$	\approx	$\equiv$	\equiv	$\propto$	\propto	$\pm$	\pm
$\mp$	\mp	$\times$	\times	$\div$	\div	$\cdot$	\cdot	$\ast$	\ast	$\star$	\star
$\ldots$	\ldots	$\cdots$	\cdots	∞	\infty	∂	\partial	∇	\nabla	$\surd$	\surd
$\Re$	\Re	$\Im$	\Im	ℓ	\ell	$\dagger$	\dagger	$\ddagger$	\ddagger	$\circ$	\circ
$\bullet$	\bullet	$\rightarrow$	\rightarrow	$\leftarrow$	\leftarrow	$\perp$	\perp	$\parallel$	\parallel	$\angle$	\angle
$\cap$	\cap	$\cup$	\cup	$\in$	\in	$\subset$	\subset	$\odot$	\odot	$\oplus$	\oplus
$\mho$	\mho										

The $\mho$ requires the package wasysym. The $\odot$ and $\oplus$ can be subscripts for the Sun and Earth.

Typefaces (Math Mode)

Inside mathematical expressions, use `\mathbf{}` and `\mathrm{}` to get boldface and roman. Or, if you have the amsmath package, use `\text{}` to get roman, with inter-word spacing, inside math (and you can use pairs of `$` inside `\text{}`). To embolden a whole formula, use `\boldmath$...$`. Use `\mathcal{}` in math mode to get $\mathcal{ABCDEF}$....

Integrals, Sums, Square Roots, Big Parentheses (Math Mode)

In regular math mode:

$\sum_{n=1}^{N}$	`sum _{n=1} ^N`	$\int_0^\infty$	`int _0 ^{\infty}`
$\sqrt{b^2-4ac}$	`\sqrt{b^2-4ac}`	$\left(\frac{a}{b}\right)$	`\left ( \frac{a}{b} \right )`
$\lim_{x\rightarrow 0}$	`\lim_{x \rightarrow 0}`		

In display style these look like

$$\sum_{n=1}^{N} \qquad \int_0^\infty \qquad \sqrt{b^2-4ac} \qquad \left(\frac{a}{b}\right) \qquad \lim_{x\rightarrow 0}$$

Display style could be between `\begin{equation}` and a `\end{equation}`, or between a `\[` and a `\]`. (In LaTeX, using pairs of `$$` is deprecated). These both create a separate equation; the first adds an equation number. You can also use display style in text; for example, `$\displaystyle \int _0 ^{\infty}x\,dx$` gives $\displaystyle\int_0^\infty x\,dx$; the `\,` is included to produce enough space between the x and the dx. The symbol $\oint$ is available as `\oint`.

Big Fractions (Math Mode)

In LaTeX, using `\over` is deprecated. In text style, use `\frac{ad}{bc}` to get $\frac{ad}{bc}$ in text style; in display style this gives

$$\frac{ad}{bc}$$

Matrices (Math Mode)

To get $\left(\begin{array}{ccc} a & b & c \\ d & e & f \\ g & h & i \end{array}\right)$ you would type

```
\left(
\begin{array}{ccc}
a & b & c \\
d & e & f \\
g & h & i \\
\end{array}
\right)
```

where the `ccc` in the `array` line determines the number of columns and that the entries are centered. In the body, the `&` separates entries in a row,

and \\ separates rows. The \\ must occur at the appropriate places; newlines are irrelevant, but often used, as here, to make the source easier to read.

Aligned and Multiline Equations (Math Mode)

Aligning equations using `eqnarray` is deprecated. Instead, use the `split`, `multline`, and `align` constructions, which require the package `amsmath`. To align some element in later lines with something in the first line, use `split`, and precede the alignment point with a `&`. For example,

```
\[
\begin{split}
a &= b+c \\
&= e+f +g
\end{split}
\]
```

will produce

$$\begin{split} a &= b+c \\ &= e+f+g \end{split}$$

Note that `split` comes inside the `\[ \]` which are what actually set the math environment.

The `\multline` command arranges multiline equations with the first line left-justified, the last line right-justified, and lines between centered; for example,

$$\begin{multline} \frac{\pi}{\sqrt{12}} = 1 - \frac{1}{9} + \frac{1}{45} - \frac{1}{189} + \frac{1}{729} - \frac{1}{2673} + \frac{1}{9477} - \frac{1}{32805} + \frac{1}{111537} \\ - \frac{1}{373977} + \frac{1}{1240029} - \frac{1}{4074381} + \frac{1}{13286025} - \frac{1}{43046721} \\ + \frac{1}{138706101} - \frac{1}{444816117} + \frac{1}{1420541793} - \cdots \end{multline}$$

In both constructions you put a \\ to denote a new line, but do not put one on the last line. Finally, the `align` is used when you have several equations to align.

Tabular Arrangements (Text Mode)

To arrange things as in a table, the command `\tabular` is used; it is very like `array` but works in text mode instead of in math mode.

For example, to produce

Class	Instructor	Name
Fall Geophysics Courses		
225	Agnew	Physics of Earth Materials
233	Agnew	Computing at SIO
234	Sandwell	Geodynamics

you would type

```
\begin{tabular}[c]{lcr}
Class & Instructor & Name\\
\hline
\hline
\multicolumn{3}{c}{Fall Geophysics Courses} \\
\cline{2-3} \\
225 & Agnew & Physics of Earth Materials \\
233 & Agnew & Computing at SIO \\
234 & Sandwell & Geodynamics \\
\end{tabular}
```

where the column modes illustrated are `l` (left justified), `c` (centered), and `r` (right justified). It is also possible to put in vertical lines (called rules), but (as a matter of appearance) you should almost never do this. The `[c]` in the `\begin{tabular}`

line centers the table on the line; other choices are `[b]` and `[t]`. The `\multicolumn` allows an item the span one or more lines; the first argument (here `3`) is how many to span, and the second how to align the result. The `cline` command puts a horizontal line over the range of columns given. Using `\renewcommand{\arraystretch}{1.5}` would add 50% space vertically.

The `\tabular` command makes a table-like arrangement; the `\table` command makes the table a separate object that can float to other locations in the text.

Floats, Labels, References

Floating object include tables and figures, set with (for a table)

```
\begin{table}[]
   .....
\caption{}      or  \caption{}{}      for a table of figures or tables
\label{}
\end{table}
```

The table location is `[t]` to float to the page top, `[b]` to the bottom, or `[h]` for the current location.

In a table or figure the `\label` must be after the caption; in a displayed equation it may be just after the `\begin{equation}`; for a sectional heading it is also just after the `\section{}` or equivalent. To get the number associated with a label, use `\ref{}` with the label name.

Importing Figures

If you use LaTeXto produce a `.dvi` file which is then converted by `dvips`, you should import only EPS files. If you use pdfLaTeXto produce a `.pdf` file, you can import PDF, PNG, and JPEG files. To import EPS, use the graphicx package by putting `\usepackage[dvips]{graphicx}` to get the graphicx package. Then import a file named `file.eps` with

```
\includegraphics[options]{file.eps}
```

where the options have the form `key=val` separated by commas, for example `height=2in,width=4in`; other keys are `scale` (magnification), `angle` (rotation ccw), `loc` (point of rotation, may be `bct` combined with `lr`), and `draft` (if true, plot box only). Values use the usual units, or may be `\textwidth` or `\columnwidth`.

Use `\graphicspath{`*dirlist*`}` to give a comma-separated list of directories that contain graphics files.

Useful Packages and Document Classes

In addition to the amsmath, graphicx, and wasysym packages already mentioned, the following packages may be useful:

tabularx	tabular with more column options	longtable	tables longer than a page
setspace	set space between lines	fullpage	sets narrow margins
geometry	set document dimensions	multicol	single and multiple columns
enumerate	more flexible labels in lists	caption	extended caption capabilities
natbib	author-year and numbered references	siunitx	printing SI units
pgf	graphics creation	xcolor	color management
alltt	flexible verbatim environment		

Some useful document classes are:

beamer	produces presentations and slides	memoir	full-featured book production, with options from many other packages