LaTeX Math Mode

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LaTeX has a special mode for formatting mathematic

This mode allows the use of:

- Subscripts and superscripts

- Greek letters and various special symbols

Example of text that uses math mode:

The CH_3COOH was irradiated with α-rays wh temperature of $350^\circ C$.

Math mode comes in two flavors, text and display.

Text math mode allows you to put mathematical
(such as $\int_0^\infty x\,dx$) directly into the running text.

Display math mode seperates the expression from t

$$\int_0^\infty x\,dx.$$

To start text math mode, one can use either of:

    \begin{math}   or $

To end math mode, use the corresponding one of:

    \end{math}   or $

It is important to make sure that the way you start matches the way you started it. For example,

    \begin{math} math stuff $

will not work.

For numbered equations:

`\begin{equation} ... \end{equation}`

For unnumbered equations:

`\begin{displaymath} ... \end{displaymath}`

or

`$$ ... $$`

To get numbers in math mode, just type them as
would. The same goes for any of the symbols $=$,
(,), [,], :, ?, /.

To display a variable, just type it in. It will appe
which is correct. Don't use math mode just to it
though.

To properly present mathematical functions, like s
`lim`, use the appropriate command (eg `\cos`). This
the function names in non-italic letters with correct

Spaces are completely ignored in math mode excep
end command names.

Math mode is often used to typeset various useful s

To get Greek letters, use \lettername in math mod
you can capitalize the name of the letter to get a c

Most other useful symbols have associated comma
ample, \geq and \leq give $\geq$ and $\leq$, while ^{\circ} gi
symbol: °.

Examples:

Command	Result	Command
γ	γ	Γ
180°C	180°C	$x < y \leq 1$

To get a superscript, use `^{text}`. To get a su

`_{text}`.

Both a subscript and a superscript can be placed on
pression. Use braces for grouping if you need nested s

To get a $'$ (prime), use $'$ repeated as many times a

Examples:

Command	Result	Command
`a^{b}`	a^b	`a^{b + c}`
`a'`	a'	`a'''`
`a_{b}`	a_b	`a_{b + c}`
`a_{0}^{n+1}`	a_0^{n+1}	`a^{n+1}_{0}`

To put a subscript or a superscript on text that shou
math mode, just start math mode, do the sub- or
and end math mode. Examples:

Text	Result
CH$_{3}$COOH	CH_3COOH
180°C	$180^{\circ}C$
$^{238}_{92}$U	$^{238}_{92}U$

For a fraction, use \frac{numerator}{denominator}.

For a square root, use \sqrt{radicand}.

For an n-th power root, use \sqrt[n]{radicand}.

Examples:

Command	Re
\sqrt{3x + 5}	$\sqrt{3}$
\sqrt[3x]{3x + 5}	$\sqrt[3x]{3}$
\frac{n^2 + n + 1}{\sqrt{3n + 4}}	$\dfrac{n^2-}{\sqrt{3}}$

Most common mathematical functions have corresp
mands which are just names of the functions:

- To get a summation sign ($\sum$) use \sum.

- To get an integral sign ($\int$) use \int.

- \lim, \log, \sin, \cos, \tan, \sec, \csc, \cot
  formatting of these common functions.

Command	Result
`\log (3x + 5)`	$\log(3x + 5)$
`\cos (5x + x^2)`	$\cos(5x + x^2)$
`\sin^{2} (4x + 7)`	$\sin^2(4x + 7)$
`\lim \frac{1}{n}`	$\lim \frac{1}{n}$

Most common mathematical symbols have correspo

mands related to the symbol name or symbol appea

There is a symbol table provided at the end of the

your reference in the future.

Examples:

Command	Result	Command	R
\cap	∩	\cup	
\in	∈	\nabla	
\subset	⊂	\supset	
\geq	≥	\leq	
\ldots	...	\cdots	

An arbitrary relational symbol can be negated usi
command. Examples:

Command	Result	Command
\not\leq	$\not\leq$	\not>
\not\subset	$\not\subset$	\not\approx

There are also two commands that create a speci
symbol: \neq and \notin. These exist because t
symbols look better than \not= and \not\in would.

Command	Result	Command	R
\neq	$\neq$	\notin	

Many times, the above functions have upper and lo

These can be indicated using _ for the lower bound a

upper bound.

To best display unions and intersections that are b

`\bigcup` and `\bigcap` instead of `\cup` and `\cap`.

In text:

$\sum_{i=0}^{\infty} i$
$$\sum_{i=0}^{\infty} i$$

$\int_{3}^{2x} y \, dy$
$$\int_{3}^{2x} y \, dy$$

$\lim_{n \to \infty} \frac{1}{n}$
$$\lim_{n \to \infty} \frac{1}{n}$$

In displays:

$\sum_{i=0}^{\infty} i$
$$\sum_{i=0}^{\infty} i$$

$\int_{3}^{2x} y \, dy$
$$\int_{3}^{2x} y \, dy$$

$\lim_{n \to \infty} \frac{1}{n}$
$$\lim_{n \to \infty} \frac{1}{n}$$

In text:

`\bigcap_{i=0}^{\infty} U_i` $\qquad \bigcap$

`\bigcup_{k=3}^{n} \{1, 2, \ldots, k\}` $\qquad \bigcup_{k=3}^{n}\{$

In displays:

`\bigcap_{i=0}^{\infty} U_i`

`\bigcup_{k=3}^{n} \{1, 2, \ldots, k\}` $\qquad \displaystyle\bigcup_{k=3}^{n}\{$

`(\bigcup_i U_i) \cup (\bigcup_i V_i)` $\qquad \displaystyle(\bigcup_i U$

To make text in math mode bold, use: `\mathbf{text`

To make calligraphic capital letters, use: `\mathcal{`

To make "blackboard bold" capital letters (eg. $\mathbb{R}$, the `amsfonts` package (`\usepackage{amsfonts}` in th preamble) and use: `\mathbb{letter}`.

Examples:

Command	Result	Command
`(\mathbf{x + 1})x`	$(\mathbf{x + 1})x$	`\mathcal{A}`
`\mathbb{R}`	$\mathbb{R}$	`\mathbb{Z}`
`\mathbb{C}`	$\mathbb{C}$	`\mathbb{Q}`

```
! Missing $ inserted.
<inserted text>
                    $
l.8
```

?

You have forgotten to end math mode. The line r
the "l." (in this case "8") is the first line at whic
realized that you have forgotten to end math mode;
the end of the paragraph the error is in.

Common cause: Forgetting to put a \ before a %.

```
! Missing $ inserted.
<inserted text>
                  $
l.6 30^
        \circ
?
```

You have used a command (in this case ^) which LAT$_E$
longs only in math mode. The line number given is
of the command in question.

```
! LaTeX Error: \begin{displaymath} on input line &
  \end{document}.

See the LaTeX manual or LaTeX Companion for explan
Type  H <return>  for immediate help.
 ...

l.10 \end{document}

?

You have forgotten to end display math mode. The
on which math mode began is listed (in this case, "in
```

```
! LaTeX Error: \mathbb allowed only in math mode.

See the LaTeX manual or LaTeX Companion for explan
Type  H <return>  for immediate help.
 ...

l.6 \mathbb
           {stuff}
?
```

The command in question (in this case \mathbb) is
in math mode and you have tried to use it outside of