Math Test

December 21, 2010

1 Limit

A limit:

$$\lim_{x \to \infty} f(x),$$

which should appear as $x \to \infty$ in italics, and «lim» in plain style. Inlined: $\lim_{x \to \infty} f(x)$.

And why not, a sum:

$$\sum_{i=1}^{\infty} a_i,$$

where the sum's limits should appear below ($i = 1$) and above (∞) the $\sum$ but to the right. Inlined: $\sum_{i=1}^{\infty} a_i$. Integral: $\int_{x=a}^{\infty} x \, dx$. Display mode:
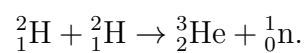
$$\int\limits_{x=a}^{\infty} x \, dx.$$

We can also integrate without limits: $\int A \, dx$.

A sum inside another element (red color):

$$\textcolor{red}{\sum_{i=1}^{\infty} a_i}.$$

When any element has both super- and subscript, they should appear like inlined limits, one above the other: a_4^3. Also before an element: ^3_2He. In display mode:

$$\sum_{i,j} a_j^i + \sum_{i,j} a_i^j = \sum_i a_i^i,$$

$$^2_1\text{H} + {}^2_1\text{H} \to {}^3_2\text{He} + {}^1_0\text{n}.$$

2 Numeration

Equations can be numbered, like 1.

$$y = x \tag{1}$$

And also like 2.

$$x = 3 \tag{2}$$

Notice that eq. 2 comes after eq. 1.
Some equations can also be numbered, even if they don't have a label.

$$x = 2y \tag{3}$$

Other equations that contain * should not numbered, but perhaps aligned:

$$left \qquad\qquad right$$

Some environments allow for multiple labels:

$$
\begin{aligned}
a &= b \times c \tag{4} \\
c \times d \times e &= i. \tag{5}
\end{aligned}
$$

Now a random environment: xy.

3 Parentheses

Some delimiters also taken from the Spanish Lyx User's Guide. An array:

$$
\begin{bmatrix}
12 & 2 \\
3 & 4 \times y^x
\end{bmatrix}
$$

And an inline array $\begin{bmatrix} a & b \\ c & dio \end{bmatrix}$.

There are also big brackets: (a) $[b]$ $\{c\}$ $\langle d \rangle$ $|e|$ $\langle f \rangle$.

Aligned brackets can be present: $(toText)$. One of them may be omitted: $toText)$.

4 Fraction

A big recursive fraction:

$$\frac{1}{\left(1 + \left(\frac{1}{1+\left(\frac{1}{1+2x}\right)}\right)\right)}$$

A nice fraction: $5/6$.

A non-diminishing fraction containing alignments:

$$\frac{1}{1 + \left(\dfrac{1}{1+x} \times \dfrac{1}{1+x}\right)}.$$

A similar concept is a binomial coefficient: $\binom{A+1}{B}$. It can be prettily presented:

$$\binom{A}{B+1}.$$

A symbol can be stacked over another using \stackrel: $x \stackrel{R}{\to} y$. Anything can be stacked: $\stackrel{head}{heels}$.

5 Roots

A square root: $\sqrt{3}$. A root in a fraction: $\sqrt{\frac{(78x+45y)\times\sqrt{Height}}{\sin(x+1)} + 5}$.

A more complex square root in a fraction:

$$\frac{1}{\left(1 + \sqrt{2}\left(\frac{1}{1+\sqrt{2}}\right) + \sqrt{\frac{1}{2}}\right)}.$$

Higher order roots: $\sqrt[3]{x+y}$, $\sqrt[x+1]{Weight}$. In a fraction:

$$\frac{\sqrt[7/8]{\frac{8}{4}x}}{\sqrt[s+5]{\frac{(78x+45y)\times\sqrt{Height}}{\sin(x+1)}} + 5}.$$

6 Decorations

6.1 Cases

Used to switch several values.

$$y = \begin{cases} x & i = 0, \\ x+1 & i < 3 \end{cases}$$

Cases may have more than two rows:

$$f(x) = \begin{cases} 0 & x < 0, \\ \infty & x = 0 \\ 0 & x > 0 \end{cases}$$

6.2 Braces

Values can be underbraced or overbraced.

$$\underbrace{a-b} = \overbrace{c+d+e}+f.$$

Underbraces and overbraces can contain text.

$$\overbrace{a-b}^{over} = \underbrace{c+\overbrace{d+e}^{over}+f}_{under}+g.$$

They can also be inlined: $\overbrace{a+b}^{over}$.

7 Spacing

The command \raisebox is useful to, surprisingly, raise a little box.

raised$_{over}{}_{lowered}$and back.

It can also be used just for spacing.

B^V.

There are other spacing commands, like \hspace: " ", and \vspace: "". Pro-

tected space can be used: $a\ b$.

8 Fonts

Fonts can be switched on and off.

By default, text in formulae is shown italicized. Variable: $meters$.

Some font styles. Roman: 1mathrm. Sans serif: 2mathsf. Typewriter: 3mathtt. Bold: 4**mathbf**.

Regular text. Normal text: 5textfm. Literal text: 6mbox text. Phonetic alphabet: 7abcde. Regular text can be embedded into formulae: regular text \command \another command \

Units can be shown with or without a magnitude. Without: km. With: 57 km. Fractional units: $20\,{}^{km}\!/_{h}$. With a fraction before the units: $^3\!/_2$ km, $\frac{7}{16}$ s.

Some special fonts are supported: $\mathscr{F}$, $\mathcal{F}$, $\mathbb{F}$, $\mathfrak{F}$.

There has been some trouble over some commands like Greek letters; some of them should be italicized, as in: μ or Å. Others should not, as in Ω. Upright Greek letters are also available: $\mu \neq \mu$. An example from the LyX math guide:

$$\pi^+ \to \mu^+ + \nu_\mu.$$

4

9 Colors and Boxes

A colored box: aaa .

A framed box: | box | . It can be aligned left: | box | or right: | box |.

10 Macros

Definitions can be added as macros . Then they can be used in formulae: $\sqrt{12} + \sqrt[1]{2}$.

Macro definitions can accept default parameters . Again, useful in formulae: $\sqrt[4]{5}$. Default parameters can then be overriden: $\sqrt[4]{y} + \sqrt[x]{5}$.

Other definitions from the preamble can be used: $\sqrt[3]{4}$.

Definitions on the fly are also possible: $\sqrt[7]{8}$, and used with different values: $\sqrt[a]{b}$.

Macros may contain a literal parameter . It should parse correctly: t .

A macro with four parameters from the LYX detailed math guide . Now in use: $1 + x_{1,2} = -\frac{(1-x)}{2} \pm \sqrt{\frac{(1-x)^2}{4} - 5} - B$.

11 Pathological Cases

Empty equations have been known to fail: .

An equation with an mbox containing a comment: text more, and a comment inside textrm: text more. Finally, a comment at the end of a text function: only text.

12 Bye-bye

That's all folks!