Alf's macros cheatsheet

5 de abril de 2019

Índice

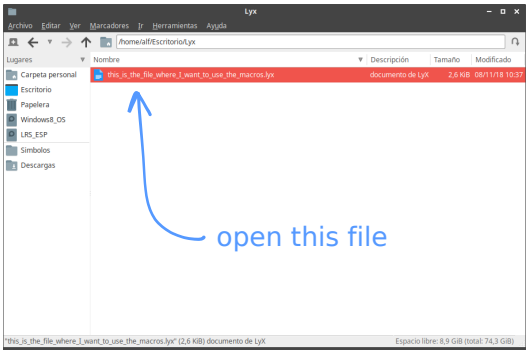
1 About this macros

The file `alf_physics_macros.lyx` contains a set of useful macros for physicists aiming to write using Lyx. This set of macros was created by a physics student along his transit through university. Thus, they were designed to provide easy and quick writing for some common notations and concepts in physics.

2 How to use this macros

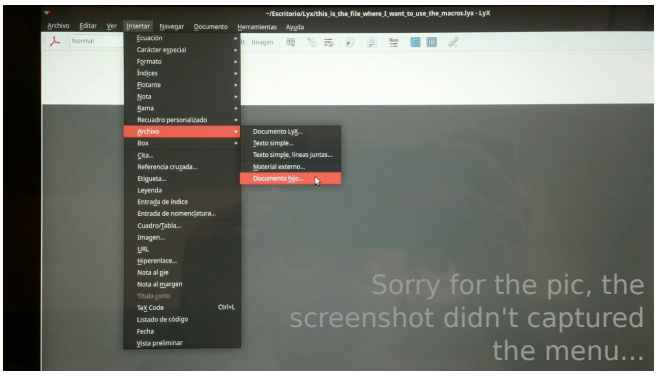
To use this macros you can just download the file `alf_physics_macros.lyx` and insert it as a child document in Lyx. To this end:

1. Go to https://github.com/SengerM/lyx and download the file `alf_physics_macros.lyx`.
2. Open the Lyx file where you want to use the macros:

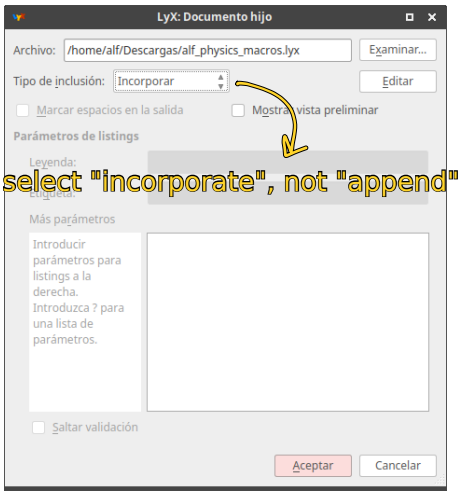


3. Insert the `alf_physics_macros.lyx` as a child document:

   (a) Open the menu “insert” → “file” (or “document” or related) → “child document”:

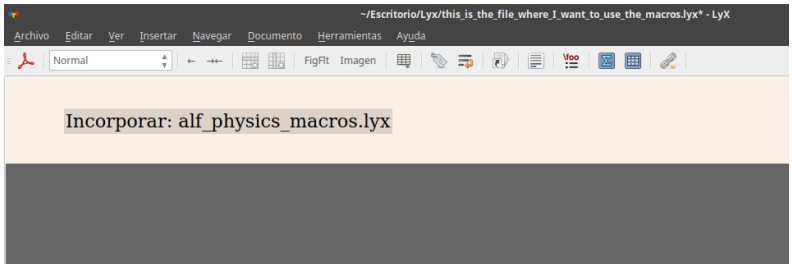


   (b) Browse your downloaded file (you can place it where you like):

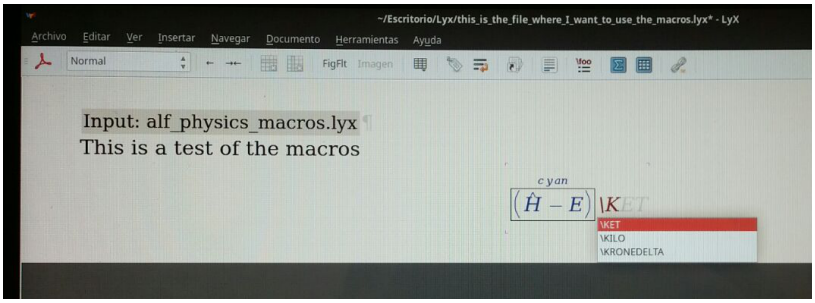


   Be sure to select the “incorporate” mode and not the “append” mode.

4. Now you should be seeing something like this:



   In this case the macros are ready to use:



   Lyx will auto-complete all the macros just included. Most of them will be renderized properly too.

3 The macros

3.1 General macros

In all cases the size of the braces is automatically adjusted.

`\ABS{#1}` Generates two bars according to the typical notation for the absolute value. Examples:

$$|x| \qquad \left|\frac{f(x)}{g(x)}\right| \qquad \begin{vmatrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{vmatrix}$$

`\PARENTHESES{#1}` Generates two parentheses. Automatically adjusts the size. Examples

$$(x) \qquad \left(\frac{f(x)}{g(x)}\right) \qquad \begin{pmatrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{pmatrix}$$

`\SQUAREBRACKETS{#1}` Draws two square brackets. Examples:

$$[x] \qquad \left[\frac{f(x)}{g(x)}\right] \qquad \begin{bmatrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{bmatrix}$$

`\CBRACES{#1}` Draws two curly braces. Examples:

$$\{x\} \qquad \left\{\frac{f(x)}{g(x)}\right\} \qquad \begin{Bmatrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{Bmatrix}$$

`\LCURLYBRACE{#1}` Places a left curly brace, useful for systems of equations. Examples:

$$\{x \qquad \begin{cases} x+4=2 \\ x-y=9 \end{cases}$$

`\RCURLYBRACE{#1}` Places a right curly brace. Example:

$$\left.\begin{array}{l} x+4=2 \\ x-y=9 \end{array}\right\} \rightarrow \text{Equations} \qquad \left.\begin{array}{l} x=3\cos y \\ \begin{bmatrix} i & 3 \\ 1 & 0 \end{bmatrix} = \mathbb{A} \end{array}\right\} \rightarrow \text{More equations } \ddot{\smile}$$

`\LSQUAREBRACKET{#1}` Places a left square bracket. Examples:

$$[x \qquad \left[\frac{f(x)}{g(x)}\right. \qquad \begin{bmatrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{bmatrix}$$

`\RSQUAREBRACKET{#1}` Places a right square bracket. Examples:

$$x] \qquad \left.\frac{f(x)}{g(x)}\right] \qquad \left.\begin{matrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{matrix}\right]$$

`\ANGLEBRACKETS{#1}` Places two angle brackets like those used in physics to specify *mean value*. Examples:

$$\langle x\rangle \qquad \left\langle\frac{f(x)}{g(x)}\right\rangle \qquad \left\langle\begin{matrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{matrix}\right\rangle$$

`\UPCBRACE{#1}{#2}` $\overbrace{\#1}^{\#2}$ Places a brace up #1 and optionally a comment can be placed in #2. Example:

$$\overbrace{[a(x)+l(x)]}f(x)=0 \qquad \overbrace{[a(x)+l(x)]}^{=0}f(x)=0$$

`\DOWNBRACE{#1}{#2}` Places a brace down #1 and optionally a comment can be placed in #2. Example:

$$\underbrace{[a\,(x)+l\,(x)]}f\,(x)=0 \qquad \underbrace{[a\,(x)+l\,(x)]}_{=0}f\,(x)=0$$

`\SPACELONG` Places a "long" blank space. This is useful when you want to separate things in an equation. Example

$$F\,(t)=\int\limits_{-\infty}^{t}f\,(x)\,\mathrm{d}x \qquad \Longleftrightarrow \qquad f=\frac{\mathrm{d}F}{\mathrm{d}t}$$

`\SPACEMID` Places a "mid length" blank space.

`\DEF` Places a "definition equal" $\overset{\text{def}}{=}$. Example

$$f\,(x)\overset{\text{def}}{=}x^2$$

`\TENDSTO{#1}` $\underset{\#1}{\longrightarrow}$ This macro generates the typical arrow used to indicate some limit. Examples

$$f\,(x)\longrightarrow 0 \qquad \frac{\varepsilon+1}{\varepsilon}\underset{\varepsilon\to 0}{\longrightarrow}\infty$$

3.2 Sets

`\REALNUMBERS` Real numbers symbol: $\mathbb{R}$.

`\IMAGINARYNUMBERS` Imaginary numbers symbol: $\mathbb{I}$.

`\COMPLEXNUMBERS` Complex numbers symbol: $\mathbb{C}$.

`\NATURALNUMBERS` Natural numbers symbol: $\mathbb{N}$.

`\WHOLENUMBERS` Whole numbers symbol: $\mathbb{Z}$.

`\RATIONALNUMBERS` Rational numbers symbol: $\mathbb{Q}$.

3.3 Special and useful functions

`\REALPART{#1}` Real part function. Example: $\mathrm{Re}\,(a+ib)=a$.

`\IMAGPART{#1}` Imaginary part function. Example $\mathrm{Im}\,(a+ib)=b$.

`\DIRACDELTA{#1}` Dirac delta function $\delta_D\,(x)$.

`\KRONDELTA{#1}` Kronecker delta δ_{ij}.

`\HEAVISIDETHETA{#1}` Heaviside theta function $\Theta_H\,(x)$.

`\INDICATORFUNCTION{#1}` Indicator function $\mathbf{1}\,\{x\}$, typically defined as $\mathbf{1}\,\{x\}=\begin{cases}1 & \text{if } x \text{ is true}\\ 0 & \text{else}\end{cases}$.

3.4 Vector notation

The macros for vectors in *alf physics macros* are only two: \VECTOR and \VERSOR. This is to help the user to maintain a unified notation along the document. This two macros caught the concept of a vector instead of the notation of a vector. When you need a vector, just call one of this macros. By default this macros convert the symbol to bold:

$$\begin{aligned}\text{Non vectors} \rightarrow \quad & a,b,c,\alpha,\beta,\gamma\\ \text{Vectors} \rightarrow \quad & \boldsymbol{a},\boldsymbol{b},\boldsymbol{c},\boldsymbol{\alpha},\boldsymbol{\beta},\boldsymbol{\gamma}\end{aligned}$$

If you want to use other notations like $\vec{a}$, $\bar{a}$ or $\underline{a}$ you can either use the default commands included in Lyx or (yet better) modify the \VECTOR macro in *alf physics macros*.

`\VECTOR{#1}` Notation for vectors. Example: $\boldsymbol{r}$.

`\VERSOR{#1}` Notation for versors (unit length vectors). Example: $\hat{\boldsymbol{r}}$.

3.5 Derivatives

`\DIFFERENTIAL` Differential symbol: d.

`\CURL` Curl symbol: $\boldsymbol{\nabla}\times$.

`\GRADIENT` Gradient symbol: $\boldsymbol{\nabla}$.

`\DIVERGENCE` Divergence symbol: $\boldsymbol{\nabla}\cdot$.

`\LAPLACIAN` Laplacian symbol: $\boldsymbol{\nabla}^2$.

`\EVALUATEDAT{#1}{#2}{#3}` $\#1|_{\#2}^{\#3}$ Notation to indicate that something is evaluated somewhere, generally used after integration. Examples:

$$x\big|_8 = 8 \qquad \frac{f(x)}{g(x)}\bigg|_{x=3}^{x=2} = \frac{f(3)}{g(3)} - \frac{f(2)}{g(2)} \qquad \begin{bmatrix} A(x) & 0 & 0 \\ 0 & L(x) & 0 \\ 0 & 0 & F(x) \end{bmatrix}\Bigg|_{x\to\infty}$$

3.6 Units

Use this macros when you need to specify some unit of measurement, for example 1 kg. This macros automatically left the space between the number and the unit, and use non-emphasis style. You can use many of the metric prefixes.

`\TERA{#1}` Metric prefix for *tera*. Example: 1 TB $\equiv 10^{12}$ bytes.

`\GIGA{#1}` Metric prefix for *giga*. Example: 1 Gpc $\equiv 3262 \times 10^6$ light years.

`\MEGA{#1}` Metric prefix for *mega*. Example: 1 M\$ $\equiv$ one millionaire.

`\KILO{#1}` Metric prefix for *kilo*. Example: 1 kg of potatoes.

`\UNIT{#1}` Unit notation with no prefix. Example: 2 V is *two volts* and $2V$ is *two times* V.

`\CENTI{#1}` Metric prefix for *centi*. Example: 1 m = 100 cm.

`\MILLI{#1}` Metric prefix for *milli*. Example: 1 mg.

`\MICRO{#1}` Metric prefix for *micro*. Example: We need a 10 μF capacitor.

`\NANO{#1}` Metric prefix for *nano*. Example: Visible spectrum is about 550 nm wavelength.

`\PICO{#1}` Metric prefix for *pico*. Example: 1 pm = 10^{-12} m.

`\FEMTO{#1}` Metric prefix for *femto*. Example: 1 fF = 10^{-15} F.

`\TIMESTENTOTHE{#1}` $\times 10^{\#1}$ Exponential notation. Example $4{,}5 \times 10^{-6}$.

3.7 Probability

`\PROBABILITY{#1}` Probability function $\mathbb{P}(\#1)$.

3.8 Colors

This library provides quick access to colors in equations in Lyx. This may be useful when you want to make some comment about some symbol, for example. There are some macros for quick access to red, green and blue colors. There is also a macro that allows you to use any color.

`\COLOR{#1}{#2}` This macro allows you to use any color you like. #1 is the symbol (or symbols) you want to give color and #2 is the desired color. In #2 you can use any of the predefined colors, namely *black, blue, brown, cyan, darkgray, gray, green, lightgray, lime, magenta, olive, orange, pink, purple, red, teal, violet, white, yellow*. Examples:

$$f\left(x\right) \qquad \frac{f(x)}{g(x)} \qquad \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$$

`\RED{#1}` Quick access to red color. Example: $r\left(x\right)$.

`\GREEN{#1}` Quick access to green color. Example: $g\left(x\right)$.

`\BLUE{#1}` Quick access to blue color. Example: $b\left(x\right)$.

`\GRAY{#1}` Quick access to gray color. Example: $f\left(x\right)$.

`\GDOWNBRACE{#1}{#2}` Places a gray brace down the #1 argument. In the #2 argument you can place some comment. Examples:

$$\underbrace{\left[a\left(x\right)+l\left(x\right)\right]}f\left(x\right)=0 \qquad \underbrace{\left[a\left(x\right)+l\left(x\right)\right]}_{=0}f\left(x\right)=0$$

`\RDOWNBRACE{#1}{#2}` Places a red brace down the #1 argument. In the #2 argument you can place some comment. Examples:

$$\underbrace{\left[a\left(x\right)+l\left(x\right)\right]}f\left(x\right)=0 \qquad \underbrace{\left[a\left(x\right)+l\left(x\right)\right]}_{=0}f\left(x\right)=0$$

`\BDOWNBRACE{#1}{#2}` Places a blue brace down the #1 argument. In the #2 argument you can place some comment. Examples:

$$\underbrace{\left[a\left(x\right)+l\left(x\right)\right]}f\left(x\right)=0 \qquad \underbrace{\left[a\left(x\right)+l\left(x\right)\right]}_{=0}f\left(x\right)=0$$

`\GUPBRACE{#1}{#2}` Places a gray brace over the #1 argument. In the #2 argument you can place some comment. Examples:

$$\overbrace{\left[a\left(x\right)+l\left(x\right)\right]}f\left(x\right)=0 \qquad \overbrace{\left[a\left(x\right)+l\left(x\right)\right]}^{=0}f\left(x\right)=0$$

`\RUPBRACE{#1}{#2}` Places a red brace over the #1 argument. In the #2 argument you can place some comment. Examples:

$$\overbrace{\left[a\left(x\right)+l\left(x\right)\right]}f\left(x\right)=0 \qquad \overbrace{\left[a\left(x\right)+l\left(x\right)\right]}^{=0}f\left(x\right)=0$$

`\BUPBRACE{#1}{#2}` Places a blue brace over the #1 argument. In the #2 argument you can place some comment. Examples:

$$\overbrace{\left[a\left(x\right)+l\left(x\right)\right]}f\left(x\right)=0 \qquad \overbrace{\left[a\left(x\right)+l\left(x\right)\right]}^{=0}f\left(x\right)=0$$

`\REDCANCEL{#1}` Cancellation bar in red color. Examples:

$$x \qquad \frac{1}{a}\left(a^{2}lf+10a\right)=alf+10 \qquad \frac{f(x)}{g(x)}$$

`\BLUECANCEL{#1}` Cancellation bar in blue color. Examples:

$$x \qquad \frac{1}{a}\left(a^{2}lf+10a\right)=alf+10 \qquad \frac{f(x)}{g(x)}$$

`\REDCANCELTO{#1}{#2}` Cancellation bar with arrow and comment in red color. Example

$$\lim_{x\to 0}\frac{1+x}{x}\sim \cancelto{1}{\frac{x}{x}}=1$$

`\BLUECANCELTO{#1}{#2}` Cancellation bar with arrow and comment in blue color. Example

$$\lim_{x\to 0}\frac{1+x}{x}\sim \cancelto{1}{\frac{x}{x}}=1$$

3.9 Bracket notation

Some macros are provided to use the Dirac notation in quantum mechanics.

`\KET{#1}` Places a ket. Examples:

$$|\psi\rangle \qquad \left|\frac{3}{2},\frac{1}{2}\right\rangle$$

`\BRA{#1}` Places a bra. Examples:

$$\langle\psi| \qquad \left\langle\frac{3}{2},\frac{1}{2}\right|$$

`\BRACKET{#1}{#2}` Places a bracket. Examples

$$\langle\psi\,|\psi\rangle \qquad \langle\psi\,|\phi\rangle \qquad \left\langle\frac{3}{2},\frac{1}{2}\middle|\frac{3}{2},-\frac{1}{2}\right\rangle=0$$

`\OPERATOR{#1}` Identifies a symbol with the operator notation. Examples: $\hat{p},\hat{H},\hat{T}$.