Millop improves LaTeX level of physicists

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Bibliography

Introduction

The idea is to have a LaTeX-documentation for the whole departement of physics at the ETH Zürich. If this works well, maybe D-MATH or D-CHAB will follow etc. As a student I don't know how this is handled within the groups but all scripts given to me to study with have not been written with the best and/or the most modern LaTeX-style. Also there are professors that don't do at all their scripts with LaTeX. So I'd like this to change.

LaTeX is really nice but whenever one wants something or to improve something, one has to google a long time through stuff that doesn't work or isn't compatible with each other. So far, I haven't found any satisfying documentation for LaTeX for physicists so I will start from zero. This document should contain as few as possible solutions but always the best known one compatible with standard packages as AMSmath, etc. Whenever a package is added, it should be documented why.

This should be built up in chapters that everybody uses like maths (integrals etc.) and chapters specific to research groups.

Chapter 1

Maths

1.1 Equation formats

1.2 align

Align to the =

$$\begin{aligned} a &= b \\ &\rightsquigarrow caoeuuu = d \end{aligned}$$

Something like this looks confusing

$$\begin{aligned} a &= b \\ &\rightsquigarrow aoeuou = d \end{aligned}$$

1.3 Integrals

Needs fix. Need to put the right negative space to make it look right. Put a grid in background in some way.

1.3.1 Simple integral

$$\int \mathrm{d}x\, x = x^2 \tag{1.1a}$$

$$\int_0^1 \mathrm{d}x\, x = 1 \tag{1.1b}$$

$$\int \mathrm{d}x\, x = x^2 \tag{1.1c}$$

$$\int_0^{10} \mathrm{d}x\, x = 100 \tag{1.1d}$$

$$\int \mathrm{d}x\, x = x^2 \tag{1.1e}$$

$$\int_0^{100} \mathrm{d}x\, x = 100 \tag{1.1f}$$

1.3.2 With fractions

Use thick space between two roman variables or between a roman variable and a fraction.

$$\int \mathrm{d}^3\mathbf{r}\,\mathbf{j}\,(\mathbf{r},t) = \int \mathrm{d}^3\mathbf{r}\,\frac{1}{2m}\left[\psi^*\left(-i\hbar\nabla\right)\psi + \psi\left(i\hbar\nabla\right)\psi^*\right] \tag{1.2}$$

$$\int \mathrm{d}^3\mathbf{r}\,\mathbf{j}\,(\mathbf{r},t) = \int \mathrm{d}^3\mathbf{r}\,\frac{1}{2m}\left[\psi^*\left(-i\hbar\nabla\right)\psi + \psi\left(i\hbar\nabla\right)\psi^*\right] \tag{1.3}$$

1.3.3 Multiple integrals

$$\iiint_V \mathrm{d}V\,\boldsymbol{\nabla}\cdot F = \iint_S \mathrm{d}S\,F \tag{1.4}$$

1.4 Derivatives

$$\frac{\mathrm{d}}{\mathrm{d}x}x^2 = x \tag{1.5a}$$

1.5 Functions

Examples of separations and their importance.

$$\sin 2\pi\cos\theta = 0 \tag{1.6a}$$

$$\sin(\theta x) = \sin\theta x \neq \sin\theta\, x = \sin(\theta)\, x \tag{1.6b}$$

1.6 Multiplications

$$1 \cdot 1 \tag{1.7a}$$

$$1\cdot 1 \tag{1.7b}$$

$$1 \cdot 1 \tag{1.7c}$$

$$0 \cdot 0 \tag{1.7d}$$

$$x \cdot x \tag{1.7e}$$

$$\boldsymbol{\nabla} \cdot x \tag{1.7f}$$

$$x\cdot x \tag{1.7g}$$

$$\boldsymbol{\nabla}\cdot x \tag{1.7h}$$

1.7 Hyphen

1.8 Braces

I recommend using dynamic sized braces like (). However when two nested braces have the same size the readability is increased if the exterior brace has a bigger size. It is very important if the nested braces are just next to each other. One possibility is to add a vphantom and don't forget to put a if needed.

$$\int \mathrm{d}^3\mathbf{r}\, \mathbf{j}(\mathbf{r},t) = \int \mathrm{d}^3\mathbf{r}\, \frac{1}{2m}\left[\langle\psi,t\,|\,\mathbf{r}\rangle\,\langle\mathbf{r}|\,\mathbf{p}\,|\psi,t\rangle + \langle\psi,t|\,\mathbf{p}\,|\mathbf{r}\rangle\,\langle\mathbf{r}\,|\,\psi,t\rangle\right] \tag{1.8}$$

Without the vphantom:

$$\int \mathrm{d}^3\mathbf{r}\, \mathbf{j}(\mathbf{r},t) = \int \mathrm{d}^3\mathbf{r}\, \frac{1}{2m}\left[\langle\psi,t\,|\,\mathbf{r}\rangle\,\langle\mathbf{r}|\,\mathbf{p}\,|\psi,t\rangle + \langle\psi,t|\,\mathbf{p}\,|\mathbf{r}\rangle\,\langle\mathbf{r}\,|\,\psi,t\rangle\right] \tag{1.9}$$

Alternative with

1.9 Prime

A' and A' look exactly the same.

1.10 Square root

1.11 Matrix

When there is an underbrace under the matrix, one needs a on both sides

$$\underbrace{\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}}_{blabla} = \begin{pmatrix}5 & 6\\ 7 & 8\end{pmatrix} \tag{1.10}$$

$$\underbrace{\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}}_{blabla} = \begin{pmatrix}5 & 6\\ 7 & 8\end{pmatrix} \tag{1.11}$$

$$\begin{pmatrix}\cdots & \cdots & \cdots\\ \cdots & 1 & \cdots\\ \cdots & \cdots & \cdots\end{pmatrix} \tag{1.12}$$

1.12 Miscellaneous

i) Use ℓ instead of l. Increases readability.

ii) $\xrightarrow{T}$ instead of $\overset{T}{\rightarrow}$

iii) $\ddots$

Chapter 2

Useful packages

2.1 pgf/tikz

2.2 change