Sample Writeup

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This is a *very* brief introduction to LaTeX that you may use as a template for your writeups. You should expect your first LaTeX document to take a relatively long time, but you will find that you get used to it quickly after that, and it is a *very* efficient system once you get used to it.

1   First Section Title

In general, you just type regular text. Put line breaks anywhere in the text file; LaTeX will handle justification for you.

Anytime you want a new paragraph, just skip a complete line in the source file. To typeset equations in the text, use dollar signs to surround the equation: $t = 0$. The dollar signs tell you that you are in "math" mode. (Note the quotation marks are two backticks and then two regular ticks.) Greek symbols, such as α and Γ, must always be typeset in math mode. In text mode, you can get *italic*, **bold**, and *slanted* fonts. Changing other aspects of the font is possible (like using other fonts besides the default Computer Modern font), but stick to the basics for now.

To write numbered equations, use the "environment:"

$$1 + 1 = 2. \tag{1}$$

Note that equations should be punctuated as if you were reading them. You can also do fractions, subscripts, superscripts, derivatives, and integrals,

$$\frac{g(x)}{x} = \frac{d}{dx} h(x) = \frac{\partial}{\partial x} f(x,y) = \int_0^\infty g_3(x)\, dx = \int dx\, r^2(x), \tag{2}$$

and with the `label` command you can refer to the equation number, as in Eq. (2). Equation numbers are maintained automatically by LaTeX, so even if you insert a new equation, the numbers and references will be corrected. Just make sure to compile your document *twice* to ensure that all references are correct.

Figure 1: Caption text can go here. Use the label command to refer to the figure.

2 Second Section Title

As a more sophisticated example of an equation, here are the optical Bloch equations:

$$\begin{array}{rcl}
\partial_t \rho_{ee} &=& i\frac{\Omega}{2}(\tilde{\rho}_{eg} - \tilde{\rho}_{ge}) - \Gamma\rho_{ee} \\
\partial_t \rho_{gg} &=& -i\frac{\Omega}{2}(\tilde{\rho}_{eg} - \tilde{\rho}_{ge}) + \Gamma\rho_{ee} \\
\partial_t \tilde{\rho}_{ge} &=& -(\gamma_\perp + i\Delta)\tilde{\rho}_{ge} - i\frac{\Omega}{2}(\rho_{ee} - \rho_{gg}) \\
\partial_t \tilde{\rho}_{eg} &=& -(\gamma_\perp - i\Delta)\tilde{\rho}_{eg} + i\frac{\Omega}{2}(\rho_{ee} - \rho_{gg}).
\end{array} \tag{3}$$

To define a multi-line equation, you have to make an array inside the equation environment. The `rcl` means to use three columns, with text right-, center-, and left-justified, respectively. The columns are separated by ampersands (&), and each line is terminated by two backslashes. I tend to be a little more picky about how equations are displayed, so here is more like how I would personally do it:

$$\partial_t \rho_{ee} = i\frac{\Omega}{2}(\tilde{\rho}_{eg} - \tilde{\rho}_{ge}) - \Gamma\rho_{ee}$$

$$\partial_t \rho_{gg} = -i\frac{\Omega}{2}(\tilde{\rho}_{eg} - \tilde{\rho}_{ge}) + \Gamma\rho_{ee}$$

$$\partial_t \tilde{\rho}_{ge} = -(\gamma_\perp + i\Delta)\tilde{\rho}_{ge} - i\frac{\Omega}{2}(\rho_{ee} - \rho_{gg})$$

$$\partial_t \tilde{\rho}_{eg} = -(\gamma_\perp - i\Delta)\tilde{\rho}_{eg} + i\frac{\Omega}{2}(\rho_{ee} - \rho_{gg}). \tag{4}$$

The extra adjustments are to get the spacing to look right (especially around the equality signs), and the `\displaystyle` command forces the fractions display at full size. Any way you look at it, typing a whole lot of equations is a lot of work, as you will see.

3 Figures

Putting in figures is one of the trickier aspects of LaTeX. To keep this file self-contained, I will only put the commands in comments here. In this example, the file `myfig.eps` is included at nominal size; the `scale` command can be used to scale it to different sizes. The "`t`" after the `\begin{figure}` command tells LaTeX that the "floating" figure should be placed at the top of the page. To get it to display on the *right* page, you may have to move the figure link around a bit. You can again refer to it by its label, as in Fig. 1.

4 Citations

To cite a work, use the `\cite` command, and then put the citation in the bibliography. For example, here are citations to Cohen-Tannoudji [1] and Marte [2]. The citation numbers are automatic here as well, and the numbers are in the order that the references appear in the bibliography section below. That means you generally have to include the citations in the same order in which you refer to them in the text, if you want the numbers to be sensible. There are more sophisticated ways to do this automatically, but this mechanism is sufficent for now, and often preferred for journal submission.

References

[1] Claude Cohen-Tannoudji, "Atoms in strong resonant fields," in *Les Houches, Session XXVII, 1975 - Frontiers in Laser Spectroscopy*, R. Balian, S. Haroche, and S. Liberman, Eds. (North-Holland, Amsterdam, 1977).

[2] P. Marte, R. Dum, R. Taïeb, and P. Zoller, "Resonance fluorescence from quantized one-dimensional molasses," *Phys. Rev. A* **47**, 1378 (1993).