



HOW TO CHEAT ON YOUR L^AT_EX HOMEWORK: A BEGINNERS GUIDE TO L^YX AND L^AT_EX



Paul E. Johnson
<pauljohn@ku.edu>
August 26, 2016

crmda.ku.edu

The Center for Research Methods and Data Analysis at the University of Kansas endorses L^AT_EX as a document preparation framework and we also encourage new L^AT_EX users to consider L^YX as a graphical interface for document preparation.

This is a guide for learning about L^AT_EX from L^YX. As many people have noticed, L^AT_EX offers a seemingly endless array of special packages, functions, and code arrangements that emerge from a countless number of researchers in virtually every country in the world. Many new L^AT_EX users simply take a professor's template document and revise "inside the borders" while they learn their way around. L^YX can help because it offers a Graphical User Interface that helps novices get complicated-looking results without too much suffering.

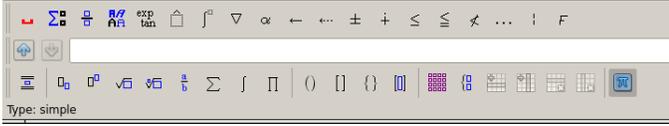
1. Open L^YX, choose **File** -> **New** in the pulldown menus. That creates the default document, which on most systems is an article. Type something.
 - a) Strictly for the record, the pull-down menus in my L^YX-2.1.4 look like this:



- b) Below the pull-down menus, there is a button bar ("ribbon"?) that looks like this:



2. In the L^YX 2.1.4 menu bar, do you see two icons like this: ? The one on the left can send your document to the L^AT_EX Compiler, choose **View PDF** (`pdflatex`) to see if your computer works correctly to compile and view a PDF version of the document. The one on the right is the update button. If you already compiled a previous version, this might be faster than compiling again from scratch and it will use the same PDF display. (I don't generally use it very much.)
3. **File** -> **Save As**. Save your L^YX file in a separate folder. Creates a file with suffix *.lyx
4. **File** -> **Export** -> **L^AT_EX** (`pdflatex`). Creates a file with suffix *.tex.

5. Check your file folder for the output
 - a) **IF YOUR OPERATING SYSTEM’S FILE BROWSER HIDES SUFFIXES, TURN OFF THAT FEATURE IMMEDIATELY.** It is absolutely certain you will become frustrated and upset when all of the files in a single folder seem to have the exact same name (because .tex, .lyx, .pdf, or other suffixes are hidden).
 - b) Open the tex file and review its contents. If your computer has to an editor with special features for editing a \LaTeX document, such as TexStudio, Tex Shop, TexMaker, TextMate, or Emacs, please use that editor.
6. In Lyx, choose **View -> Source Pane**. On right side of source pane, use the pull down menu to change “Current Paragraph” to “Complete Source”.
7. Write an alpha (α) and a beta (β) in the middle of a line.
 - a) Type “Ctl-m” (Ctl= CONTROL key. This is same as pull down menu “Insert -> Math -> Inline”).
 - b) That should open this box  and the bottom of LyX should have a math ribbon:
 
 - c) While you are learning \LaTeX , this will offer an invaluable tool to find symbols and learn how to insert structures. Play around with some of those, find α , β .
 - d) When you are “inside” the math box, you are inside a special environment. They assume that if you type something irrelevant, then you mean to go outside the math box. Examples of irrelevant things that bump you out of math box: “space bar” “down arrow” “up arrow.”
 - e) Monitor the Source Pane as you do this. It should become apparent that
 - i. β is β in \LaTeX . α is α .
 - ii. Do you still have your \LaTeX document open in \TeX Studio (or whatever)? Go in there, type β and compile it.
 - iii. LyX math mode uses that standard \LaTeX markup for greek symbols and math. If you know how to type something in \LaTeX , you can simply type same in the LyX math box, but don’t type the dollar signs that go with. The math box puts in the dollar signs for you.
8. Insert a centered “display math equation”. The short-cut key is “Ctl-M” (Same as menu “Insert -> Math -> Display Formula”). That gives you a centered math box on its own line.
 - a) Using the math tools at the bottom, point and click your way to some kind of formula.

- b) Monitor the Source pane, see how LyX suggests the \LaTeX ought to be written.
 - c) LyX Source pane now allows “Copy”, and you can then paste the math markup into your \LaTeX editor.
 - d) Some caution may be needed. To allow some fancy math, LyX may have revised the preamble.
9. Experiment with “tabular” objects in LyX. In \LaTeX , a “table” is a floating, automatically numbered environment in which users can insert “tabular” things (or other content). Ignore the floating part, just concentrate on the tabular for the moment.
- a) **Insert** -> **Table** Choose the default, 5 rows 5 columns.
 - b) Type entries into the cells. Study the Source Pane as you do this. What do you deduce?
 - i. New columns begin with “&” and at the end of a row there is a symbol “\tabularnewline”.
 - c) The default table is about the ugliest thing you can imagine. Use the tools at the bottom of the LyX display to get rid of all of the vertical lines. Note how the Source View changes.
 - d) Right click in the Table display. You should see a lot of choices, plus access to a much more elaborate “Settings” menu.
 - e) In the Settings, I want to draw your attention to one superior feature. Specify a column width in inches or centimeters.
 - f) After you make the table look beautiful, you can copy it into a \LaTeX document. This may not compile right away because LyX has also enriched the preamble to allow for the fancy features you have been using.
10. If you can find an image file on the Internet (?), save it in your project folder and then try **Insert** -> **Graphics**. These days, it is almost for sure that your LyX program can handle images in formats like png and jpg.
11. Did you notice that your PDF output looked fuzzy? That happens because the default \LaTeX setup uses fonts that were not intended for PDF output. It is up to you to change that. LyX shows how. Choose menu **Document** -> **Settings** -> **Fonts**.
- a) Change your Roman, Sans Serif, and Typewriter fonts. I almost always change to “Latin Modern”, but there are plenty of good options. I generally leave “Default family” and “ \LaTeX font encoding” unchanged. I’ve never altered the Math font and have not altered CJK in about 10 years.
 - b) The **Base Size**: defaults to 12, I often change that to 11.
 - c) Most fonts you choose are not “scalable”. An exception is Helvetica. Change the Sans Serif font to Helvetica, if you have that option, you’ll see what I mean.

- d) Warning. These changes alter the document preamble in possibly complicated ways. If you do this, I suggest you run **File -> Export -> \LaTeX (pdflatex)** so that you have a complete copy of the preamble that you can use in your \LaTeX document.
12. Try out a floating figure.
- Insert -> Float -> Figure.** When you type a title in the box, and then compare the Source Pane, you'll see that \LaTeX refers to your title as a "Caption".
 - Move the cursor outside of the title box area, but stay inside the float. Hit the Return key and type a letter. \LaTeX will allow you to type either before the figure title or after. We are not required to insert a graph here, it is OK to put in anything you like. Better try to compile the document, see if it still works.
 - This next step has changed in \LaTeX , so don't worry if it looks different for you. Left click near the end of the figure caption. So far as I know, placement is not vital, but I have a habit of doing it at the end of the caption. In the \LaTeX pulldown menu choose "**Insert -> Label**". A label does not show in the document. It is a handle you use later to refer to this figure.
 - Inside your float, try **Insert -> Graphics**.
 - Compile your document, see where your graph appears.
 - If you don't like where your graph appears, right click on the "float: Figure" handle on the floating figure object, choose "**Settings...**"
13. Try out a floating table.
- Insert -> Float -> Table.**
 - Type a caption in the title area.
 - Left click at the end of your caption, then pull down **Insert -> Label...**
14. Look back at your centered "display math" equation. You might like to number that and have a label for it too. If you right click on the equation, newer \LaTeX will show a menu. Insert a label. Usually that will turn on the equation number.
15. Now bring together all of your labels in a sublime sentence.
- I suggest you type in a new paragraph

I am the leader of the free world and in Table
 - Stop typing, pull down "**Insert -> Cross Reference**", choose your table object's label.
 - Then I suggest you keep typing

and I am the mightiest \LaTeX user on the Titanic because in Figure
 - Pull down "**Insert -> Cross Reference**", choose your figure label.
 - Then I suggest you keep typing

And because in equation () I am the meanest shadow in the darkness.

- f) Move the cursor back between the parentheses, do “Insert -> Cross Reference”, choose your equation’s label.
16. Experiment with the Environment Chooser in the top left of the LyX Graphical Interface. Depending on what kind of content you are typing, it might say Standard or Enumerate or something else. An ordinary paragraph is Standard. Don’t use the one called “paragraph”, it is for something different.
- a) Choose enumerate. That should give you numbered items, like this document.
 - b) Notice enumerate is a nested environment. Type one thing, hit enter, the next is numbered. The TAB key will indent and renumber. The TAB effect is the same as the menu button , for which the tooltip is “Increase Depth”.
 - c) The itemize environment is a “bullet point” list.
17. Experiment with environments Section and Section* and Subsection and Subsection*.
18. Use Listings, not Verbatim, to insert material from other programs.
- a) The L^AT_EX Verbatim class is often recommended, but not by people who do a lot of writing about computer programs. It has weaknesses that cause me to never use it anymore.
 - b) Instead, I use the Listings class, which is a very flexible framework that works well.
 - c) LyX can help with Listings. In the LyX Menu, choose “Insert -> Program Listing”. That should open a little box where you can type material. When you compile the document, that material will be printed in a “monospaced typewriter font”.
 - d) Suppose you have a program open and you have some output you want to put into your document. One way to do this is to copy the material and choose “Edit -> Paste Special.” Don’t do regular paste. Choose Paste Special, then Plain Text, DO NOT choose to join the lines.

Here is an example of what some R output looks like in a Listings environment:

```
1 > sessionInfo()
2 R version 3.2.3 (2015-12-10)
3 Platform: x86_64-pc-linux-gnu (64-bit)
4 Running under: Ubuntu 15.10
5
6 locale :
7  [1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C
8  [3] LC_TIME=en_US.UTF-8      LC_COLLATE=en_US.UTF-8
9  [5] LC_MONETARY=en_US.UTF-8  LC_MESSAGES=en_US.UTF-8
10 [7] LC_PAPER=en_US.UTF-8     LC_NAME=C
11 [9] LC_ADDRESS=C             LC_TELEPHONE=C
12 [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
13
14 attached base packages:
```

```

15 [1] stats      graphics  grDevices  utils      datasets  methods   base
16
17 loaded via a namespace (and not attached):
18 [1] tools_3.2.3

```

- e) The Listings class has two features that make it very useful. You can learn about one of those special features in LyX, the next I'll explain in a moment.

In Lyx, after you put some material into your Listing, right click in the Listing area and choose “**Settings**”. When I do that, I almost always change the tabulator size to 2 (save space!) and turn ON these buttons

- Break long lines
- Extended character table

Sometimes I experiment with Line numbering, as in the display above.

In my Document-wide settings, I have Latin Modern as the Typewriter font. Sometimes I notice that if I use a symbol like “~”, it does not show in the output unless I set the font that way (the default font set has limited symbols).

- f) The second special thing is that Listings defaults can be set in the preamble. This document has quite a few special features in it because I wanted you to see the potential beauty of this, but generally not too much is necessary. For example, I'd often have only

```
\lstset{tabsize=2, breaklines=true}
```

in the preamble.

- g) BE AWARE of this problem. If you paste in output from R that has “fancy quotes” (slanted quotes around the stars on p-values, for example), you will get errors compiling your document. So you have to either 1) use the R options command to set useFancyQuotes=FALSE or 2) delete those fancy quotes from the pasted in material or 3) change your L^AT_EX document encoding. I recommend 1 or 2.

19. If you have overcome the shock of the L^AT_EX & LyX experience, the last thing I ask you to investigate is the fundamental structure of the L^AT_EX document. Choose “**Document -> Settings**”. This concerns settings that are generally document wide, and it will take some time before you know which ones will ruin your document and which will have a happy result. Here are a few more highlights.

- a) Document Class. The default class is “article”. If your computer has other classes installed in your L^AT_EX distribution, you might want to try some. I remember giggling with delight at the formality of the “American Mathematical Society Book” document.
- b) Sometimes document classes fail because your computer doesn't have a required piece. So it is wise to make one change at a time and then try to compile the document.

- c) When I begin to use LyX on a new computer, I have a list of document changes I make and then I save them as my default. The settings I use are described in a separate write-up about creating an article template.
 - d) When all else fails, and LyX has no menu or chooser for your fancy settings, there is always the “old school” “~~TeX~~ Preamble” in Document settings.
 - e) Come to think of it, the LyX GUI also allows you to type raw tex as well. That’s what the TeX button  does. Among LyX oldtimers, this is known as the ERT button. Guess what that stands for? “Evil Red TeX”.
20. For a listing of my other L^AT_EX and LyX guides, please see “L^AT_EX, LyX, and Sweave Notes” <http://pj.freefaculty.org/latex>. That points to a number of documents, most of which are housed under the folder <http://pj.freefaculty.org/guides/Computing-HOWTO/LatexAndLyx>.
- In particular, I draw your attention to:
- a) LyX Beginner’s Guide <http://pj.freefaculty.org/guides/Computing-HOWTO/LatexAndLyx/LyX-Beginner/LyX-Beginner-1.pdf>.
 - b) Developing a LyX Template <http://pj.freefaculty.org/guides/Computing-HOWTO/LatexAndLyx/LyX-article-template/making-template-20150827.pdf> and the resulting LyX template document <http://pj.freefaculty.org/guides/Computing-HOWTO/LatexAndLyx/LyX-article-template/making-template-20150827.pdf>
 - c) I also developed a template (and L^AT_EX class file) for dissertations at the University of Kansas. That has been approved by the Graduate School and it is hosted in their pages, but you can always find the latest and greatest at <http://pj.freefaculty.org/guides/Computing-HOWTO/KU-thesis>
21. If you ever start to think you ought to use MS Word or similar instead, review this website again: “Charlie’s Diary: Why Microsoft Word must Die” <http://www.antipope.org/charlie/blog-static/2013/10/why-microsoft-word-must-die.html>.