Dr. Monks - Math 299

Here are some tips for doing your homework on the LyX typesetting program. I will add more tips and tricks here throughout the semester.

Installation. You can download and install LyX for Windows, Mac, or Linux, here:

> http://www.lyx.org

For Windows you probably will want to install the Bundle with MiKTeX here:

> http://wiki.lyx.org/windows/windows

Otherwise you will have to install MiKTeX separately. Note that you can also use MiKTeX by itself with any text editor to type LaTeX documents directly. A good online tutorial for LaTeX is here:

> http://www.artofproblemsolving.com/Wiki/index.php/LaTeX:About

TeXnicCenter is a great way to do that if you prefer to code LaTeX directly. You can obtain TeXnicCenter here:

> http://www.texniccenter.org

TeXnicCenter, MiKTeX and LyX are all completely free programs. One thing to keep in mind about all three programs, especially LyX. The way your document looks on the screen has very little to do with the way it will look when you convert it to pdf. The pdf version is what you print and hand in for your assignments.

Initial Setup. To make LyX more user friendly for our course, after you install it, you should do the following.

(1) Open the Tools->Preferences menu.
(2) Click on User interface under the Look & Feel option.
(3) Check the box next to Restore window layouts and geometries.
(4) Make sure the User interface file is set to default.
(5) Note that you can also change all of the interface colors and screen fonts used by the program (I usually change the background and math background color to white.) Look around at the other settings under Look & Feel and tweak to suit your tastes.
(6) Click the Save button at the bottom.
(7) Click on the Document->Settings menu and select the Document Class option on the left if it's not already selected.
(8) Change the Document Class drop down to article (ams).
(9) Below that in the Class Options->Custom: box below that, type "12pt" (without the quotes).
(10) On the left hand side of the dialog, click on Modules, and add Theorems (AMS) and Theorems (AMS-Extended) to the Selected: column from the Available: column.
(11) On the left hand side of the dialog, click on Text Layout, and check the box next to Vertical space MedSkip.
(12) Click on the Save on Document Defaults button.

(13) Click OK to close the dialog (or CLOSE if OK is greyed out).

Configuring Hotkeys. You can customize the keyboard to work exactly how you prefer in TOOLS->PREFERENCES->EDITING->SHORTCUTS. Note that if a key you select conflicts with another key you have to remove the first key definition before you set the new one.

Example 1. Let's make it so that when you press CTRL+UPARROW in math mode it gives you a superscript. Choose TOOLS->PREFERENCES->EDITING->SHORTCUTS and in the SHOW KEY BINDINGS CONTAINING: box, search for CTRL+UP. It shows you that it is initially set to PARAGRAPH-UP. Click on PARAGRAPH-UP, and click the REMOVE button. Now search for SUPER. It will show you MATH-SUPERSCRIPT is currently assigned to ALT+M E. Highlight MATH-SUPERSCRIPT. Click the REMOVE that, then click the MODIFY button and give it a new value of CTRL+UP. You can also make a similar change for subscripts, of course.

Example 2. Let's make it so that pressing SHIFT+ENTER will enter a vertical space in your document, the way it usually would do in a word processor. To do this open TOOLS->PREFERENCES->EDITING->SHORTCUTS. Click NEW. In the box that comes up type

```
inset-insert vspace bigskip
```

Click on the box next to SHORTCUT: and then press SHIFT+ENTER (it will say SHIFT+RETURN in the little box). Click OK.

Example 3. Let's make it so that pressing CTRL+SPACE will enter a horizontal space in your document, the way it usually would do in a word processor. To do this set

```
space-insert qquad
```

to have the shortcut CTRL+SPACE as in the previous examples. Click OK.

Now try it in your document. Notice that unlike ordinary spaces, a protected space has a little bracket under it. (That will not show up in your compiled document.) If you click on such a space with your mouse you will get a little pop-up dialog that you can use to set the exact width of the space under the CUSTOM option.

Example 4. An exceptionally useful kind of space is a "springy" space that stretches to fill the available horizontal room on a line (called a HORIZONTAL FILL). Let's make it so that pressing CTRL+SHIFT+SPACE will enter a horizontal fill in your document. To do this set

```
space-insert hfill
```

to have the shortcut CTRL+SHIFT+SPACE as in the previous examples. (Note that you will have to remove the shortcut from `space-insert thin` first.) Click OK.

Making a Homework Assignment. To make a homework assignment in LyX.

(1) Start a new blank document in LyX.
(2) Type your name, "Math 299", and "Assignment n" (where n is the assignment number from the Homework assignment handout) on three separate lines and then insert a stretchy space (see Example 4 above) in front of each one to right justify them to the

right like this

(3) Press SHIFT+ENTER to skip a line (see Example 3 above).

(4) Now just type the first problem number and question. After you type the question, start a new paragraph and choose PROOF from the selector on the toolbar just below the main LyX program menu at the top left corner of the LyX window. That will give you a nice proof environment to type your solution.

(5) To type math inline, press CTRL+M. To type display math (centered on it's own line) press CTRL+SHIFT+M. You can type LaTeX commands that begin with a \ in math mode or just use the math toolbars.

Seeing your LaTeX Source Code. To see the LaTeX code that LyX is producing for you, choose VIEW->VIEW SOURCE from the menu. This is a good way to learn LaTeX commands to use in your math expressions and for when you type a paper entirely in LaTeX code.

Typing Formal Proofs in LyX. Since the most annoying part of typing a formal proof is numbering and spacing, here are some tips to help you do that efficiently in LyX.

The LyX Proof environment is not designed for formal proofs. So you can just type the Theorem you are trying to prove at the top of your proof, followed by the word "*Proof*:" on a line by itself. Leave a space (INSERT -> FORMATTING -> VERTICAL SPACE -> MEDSKIP or press SHIFT+ENTER and then right click it to change it to a MEDSKIP) between the theorem statement and the proof.

Then start a numbered list by clicking the appropriate toolbar item. Indent your Assume statments using hard spaces (CTRL+SPACE). Put a stretchy space (CTRL+SHIFT+SPACE) between the statements and reasons to force the reasons to be right aligned. Once you make a single line like this, you can use copy and paste to make lots of similar lines to edit so you don't have to keep inserting the spacing.

A fast way to enter the math symbols used in logic is to type their latex command directly rather than enter them from the toolbars. For example, to enter the symbol $\neg$ just press CTRL+M to enter math mode, then type \NEG followed by the space bar. It will automatically turn into the appropriate symbol. Other useful symbols and their shortcut names are:

Symbol	Name
$\neg$	\neg
$\Rightarrow$	\Rightarrow
$\Leftrightarrow$	\Leftrightarrow
$\leftarrow$	\leftarrow
$\rightarrow\leftarrow$	\rightarrow\leftarrow
$\vee$	\vee
$\wedge$	\wedge
$\forall$	\forall
$\exists$	\exists

Here is an example:

3. **Theorem**: $\neg\neg P \Rightarrow P$

Proof:

(1)	Assume $\neg\neg P$	-
(2)	Assume $\neg P$	-
(3)	$\rightarrow\leftarrow$	$\rightarrow\leftarrow +; 2, 1$
(4)	$\leftarrow$	-
(5)	P	$\neg-; 2, 3$
(6)	$\leftarrow$	-
(7)	$\neg\neg P \Rightarrow P$	$\Rightarrow +; 1, 5$

QED

Printing. The easiest way to print your document in L_YX is to choose View->PDF (pdflatex) from the L_YX menu, and then print the pdf document that appears in your pdf viewer (e.g. Adobe Reader, or your web browser, etc.).