

The L^AT_EX Tutorial

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Chapter 1

Introduction

1.1 Welcome to LyX!

This file is designed for all of you who have never heard of L^AT_EX, or don't know it very well. Now, don't panic - you won't need to learn L^AT_EX to use LyX. That is, after all, the whole point of LyX: to provide an almost-WYSIWYG interface to L^AT_EX. There are some things you will need to learn, however, in order to use LyX effectively.

Some of you probably found your way to this document because you tried to put two spaces after a “.” or tried to put 3 blank lines between paragraphs. After much frustration, you found you couldn't. In fact, you'll find that most of the little tricks you're accustomed to using in other word processors just won't work in LyX. That's because most word processors you've used before allow you to manually enter all spacings, font changes, and so on. So you end up not only writing a document but typesetting it, too. LyX does the typesetting for you, in a consistent fashion, letting you focus on the important things, like the content of your writing.

So, bear with us and read on. Reading this tutorial is definitely worth the time.

1.2 What the Tutorial *is* and What it *isn't*

Before we get started with this section, we want to make a quick note of something. The *Tutorial* uses the notation outlined in the *Introduction*. If you came to this manual first, go read the *Introduction*. Yes, we mean now.

Now that you know which fonts mean what, we want to talk a bit about what this *Tutorial* is for.

1.2.1 Getting the Most out of the Tutorial

This tutorial consists of examples and exercises. To get the most out of this document, you should read through the document, typing all the silly little things we're telling you to type and trying out all of the exercises to see if you get them right. For convenience, you might want to print out the PostScript® version of this document.

If you are familiar with L^AT_EX, you'll probably be able to read the *Tutorial* somewhat faster, since many L^AT_EX ideas are just L^AT_EX ideas in disguise. However, L^AT_EX does have idiosyncrasies¹ you'll want to learn about. Even if you don't feel like reading the rest of the *Tutorial*, you should definitely check out Section 5.2, which is specifically written for experienced L^AT_EX users.

1.2.2 What You *Won't* Find:

- Detailed explanations of all of L^AT_EX's features.

What, you want the *User's Guide* twice?

Seriously, though, we're here to get you up and running so that all you need is the *User's Guide*. If we tried to duplicate all of the information about all of L^AT_EX's features in here, the *Tutorial* would be redundant, too long, and forever out of date. All we do here is introduce things; imagine there is a "see the *User's Guide*" at the end of every section.

- Detailed explanations of L^AT_EX.

Unnecessary. If you're really curious about learning some of the neat tricks you can do with L^AT_EX, you can always go get a L^AT_EX book. There are several good ones on the market. No need to reinvent the wheel, after all...

So, brave soul, it's time to move onwards. Time for your first document ...

¹or, more optimistically, "features"

Chapter 2

Getting Started with L_YX

2.1 Your First L_YX Document

OK. You're ready to start writing. Before you do, though, there are a few things we need to mention, which will hopefully make the *Tutorial* more instructive, useful, and fun.

Because there's lots of information that we won't be giving you, the *first* thing that you need to do is find the other help files. Luckily, this is very simple. Start up L_YX. Choose the *User's Guide* from the Help menu. You may want to load the *Tutorial* as well (if you're not reading it on screen already). This way, you can read them while you're writing your own file¹. Note that once you've got more than one document open, you can use the Documents menu to switch between them. The *Tutorial* will not cover in detail subjects which are described in the other L_YX manuals. This may make life a bit harder for you at the beginning, but it will keep the *Tutorial* short. It will also get you in the habit of using the other manuals, which — in the long run — will save you a lot of time.

In this *Tutorial*, we're going to assume that you have a fully working version of L_YX, as well as L^AT_EX, `xdvi` or some other dvi viewer, `dvips` or some other way of converting dvi documents to PostScript® documents, and a working printer. This is a lot to assume. If any of this is not true, you (or a friendly system administrator) will need to set up your system. You can find information on setup in other manuals.

Finally, we've written a file to let you practice your L_YX skills on. It's called `example_raw.lyx`. Imagine that it was typed by someone who didn't know about any of L_YX's great features. As you learn new L_YX functions, we'll suggest that you fix those parts of `example_raw.lyx`. It also contains "subtle" hints about how to fix things². If you want to cheat (or check what you've done), there's also a file called `example_lyxified.lyx` which contains the same text

¹They can also serve as good examples of how to use the many features of L_YX.

²The hints are located in yellow "Notes". Access the text in a note by clicking on it.

as written and typeset by a L^AT_EX master.

The example files can be found in the `examples/` directory, which you can get to by selecting `File`▷`Open` and then clicking on the `Examples` button. Open the raw document, and use `File`▷`Save As` to save a copy in your own directory for you to work on. As you fix parts of the raw document, check to see how those changes affect the dvi output.

By the way, the `examples/` directory contains lots of other examples files. They will show you how to do various fancy things with L^AT_EX. They are especially useful to display things that (due to length or other reasons) won't fit in the documentation. After you read the *Tutorial*, or when you're confused about how to do something fancy in L^AT_EX, take a look at these files.

2.1.1 Typing, Viewing, and Printing

- Open a new file with `File`▷`New`
- Type a sentence like: `This is my first LyX document!`
- Save your document with `File`▷`Save As`.
- Run L^AT_EX to create a dvi file, with `View`▷`DVI`. You may see things being printed in the window you ran the `lyx` command from. These are messages from L^AT_EX, which you can ignore for now. L^AT_EX will run `xdvi` (or some other dvi viewer), which will pop up a new window displaying what your document will look like when printed.³
- Print by using `File`▷`Print` and hitting OK.

Congratulations! You've written and printed your first L^AT_EX document. All of the rest is just details, which is covered in the rest of the *Tutorial*, the *User's Guide*, and the *Extended Features*.

2.1.2 Simple Operations

L^AT_EX can of course do most of the things you're used to doing with a word processor. It will word-wrap and indent paragraphs automatically. Here's a quick description of how to do some simple actions.

Undo L^AT_EX has multiple levels of undo, which means you can undo everything you've done since your current editing session started, by selecting `Edit`▷`Undo` over and over again. If you undo too much, just select `Edit`▷`Redo` to get it back.

Currently, undo is limited to 100 steps. Undo also doesn't work for *everything*; for instance, changes to the document layout. Each of these is really a L^AT_EX bug.

³You can save time by leaving `xdvi` running in the background. Then, you can use `View`▷`Update`▷`DVI` and just click on the `xdvi` window (or unminimize it) after L^AT_EX finishes running.

Cut/Paste/Copy Use **E**dit▷**C**ut, **E**dit▷**C**opy, and **E**dit▷**P**aste to cut, copy, and paste. Or automatically paste selected text (including selections from other programs) with the *middle mouse button*.

Find/Replace Use **E**dit▷**F**ind & **R**eplace for a search. In the dialog, search with the **F**ind button, and use the **R**eplace button to replace a word you’ve found⁴. If you like, you can specify whether to make the search case-sensitive, or to search for only complete words; you can also search backwards through the document.

Character Formatting You can *emphasize* text (which will generally put characters in italics), put it in **bold face**, or in **NOUN STYLE** (usually small caps, used for people’s names) from the toggle buttons in the **E**dit▷**T**ext **S**tyle dialog.

Toolbar There are buttons on the toolbar (just below the menus) which allow you to do some of the more popular functions, such as **P**aste and **P**rint.

Of course, you haven’t yet written enough to make most of these functions useful. As you write more, though, try undoing, pasting, etc.

2.1.3 WYSIWYM: Whitespace in L_AT_EX

One of the hardest things for new users to get used to is the way that L_AT_EX handles whitespace. As many times as you hit **R**eturn, you’ll only get one blank line. As many times as you hit **S**pace, you’ll only get one space. On a blank line, L_AT_EX won’t let you type even one space. The **T**ab key won’t move you forward one tab stop; in fact there *are* no tab stops! There’s no ruler at the top of the page to let you set tabs or margins, either.

Many commercial word processors are based on the WYSIWYG principle: “What You See Is What You Get.” L_AT_EX, on the other hand, is based on the principle that “What You See Is What You *Mean*.” You type what you mean, and L_AT_EX will take care of typesetting it for you, so that the output looks nice. A **R**eturn grammatically separates paragraphs, and a **S**pace grammatically separates words, so there is no reason to have several of them in a row; a **T**ab has no grammatical function at all, so L_AT_EX does not support it. Using L_AT_EX, you’ll spend more of your time worrying about the *content* of your document, and less time worrying about the *format*. See the *Introduction* for more information on the WYSIWYM concept.

L_AT_EX does have (many) ways to fine-tune the formatting of your document. After all, L_AT_EX might not typeset *exactly* what you mean. The *User’s Guide* has information about all that. It includes **H**Fills and vertical space — which are

⁴Close the window when you’re done. Or leave it open if you find it more convenient. Most dialog boxes in L_AT_EX — including the **F**ind & **R**eplace, **T**able of **C**ontents, and **L**ayout dialogs, as well as the various math dialogs can operate like this. A few dialogs, like **F**ile▷**O**pen, won’t let you type anything in the main L_AT_EX window until you actually close the dialog. Just be sure you have the right window focus when you’re trying to type in the main L_AT_EX window or give a command in some other L_AT_EX dialog.

more powerful and versatile than multiple spaces or blank lines — and ways to change font sizes, character styles, and paragraph alignments by hand. The idea, though, is that you can write your whole document, focusing on content, and just worry about that fine-tuning at the end. With standard word processors, you’ll be distracted by document formatting throughout the writing process.

2.2 Environments

Different parts of a document have different purposes; we call these parts *environments*. Most of a document is made up of regular text. Section (chapter, subsection, etc.) titles let the reader know that a new topic or subtopic will be discussed. Certain types of documents have special environments. A journal article will have an abstract, and a title. A letter will have neither of these, but will probably have an environment that gives the writer’s address.

Environments are a major part of the “What You See Is What You Mean” philosophy of L_AT_EX. A given environment may require a certain font style, font size, indenting, line spacing, and more. This problem is aggravated, because the exact formatting for a given environment may change: one journal may use boldface, 18 point, centered type for section titles while another uses italicized, 15 point, left justified type; different languages may have different standards for indenting; and bibliography formats can vary widely. L_AT_EX lets you avoid learning all the different formatting styles.

The Environment box is located on the left end of the toolbar (just under the File menu). It indicates which environment you’re currently writing in. While you were writing your first document, it said “Standard,” which is the default environment for text. Now you will put a number of environments in your new document so that you can see how they work. You’ll do so with the Environment menu, which you open by clicking on the “down arrow” icon just to the right of the Environment box.

2.2.1 Sections and Subsections

Type the word `Introduction` on the first line of your L_AT_EX file, and select `Section` from the Environment menu⁵. Be sure to use `Section` and *not* `Section*`, which will be covered below. L_AT_EX numbers the section “1” and typesets the section heading (title) in a larger font. Now hit `Return`. Note that the Environment box changes from “Section” back to “Standard”. Section headings, like most environments, are assumed to end when you type `Return`. Type the document introduction:

```
This is an introduction to my first LyX document.
```

⁵You don’t have to *select* the line. If nothing is selected, L_AT_EX changes the paragraph you are currently in to the selected environment. Alternatively, you can change several paragraphs to a different environment by selecting them before picking an environment.

Hit Return again, and select Section from the Environment menu again. LyX writes a “2” and waits for you to type a title. Type `More Stuff`, and you’ll see that LyX again sets it as a section title.

It gets better. Go to the end of Section 1 again (after “my first LyX document”) and hit Return again, and select Section from the Environment menu again. Again, LyX writes “2” and waits for you to type a title. Type `About This Document`. Section “More Stuff”, which used to be Section 2, has been automatically renumbered to Section 3! In true WYSIWYM fashion, you just need to identify the text that makes up the section titles, and LyX takes care of numbering the sections and typesetting them.

Hit Return to get back to the Standard environment, and type the following five lines:

```
Sections and subsections are described below.
Section Description
Sections are bigger than subsections.
Subsection description
Subsections are smaller than sections.
```

Click on the second line and select Subsection from the Environment menu. LyX numbers the subsection “2.1”, and typesets it in a font which is bigger than regular text but smaller than the section title. Change the fourth line Subsection environment as well. As you probably expected, LyX automatically numbered the section “2.2”. If you put yet another section before Section 2, Section 2 will be renumbered as Section 3, and the subsections will be renumbered to “3.1” and “3.2”.

Further levels of sectioning include Subsubsection, Paragraph, and Subparagraph. We’ll let you play with these on your own. You may notice that paragraph and subparagraph headings are not numbered by default, and that subparagraphs are indented; see the *User’s Guide* to change this. Chapter headings are actually the highest level of sectioning, above Sections, but you’re only allowed to use them in certain types (text classes) of LyX documents (see Section 3.1).

Finally, you may want to have sections or subsections that are not numbered. There are environments for this as well. If you change one of your section headings to the Section* environment (you may have to scroll down in the Environment menu to find it), LyX will use the same font size for the heading as it uses for a regular section, but it won’t number that section. There are corresponding “starred” heading environments for Subsection and Subsubsection. Try changing some of your sections or subsections to the starred environments, and note how the other sections’ numbers are updated.

Exercise: Fix the section and subsection headings in `example_raw.lyx`.

2.2.2 Lists and sublists

LyX has several different environments for typesetting lists. The various list environments free you from hitting Tab a million times when writing an outline,

or from renumbering a whole list when you want to add a point in the middle of the list, and lets you concentrate on the list content.⁶ Different types of documents logically require different list environments:

- A slide presentation might use the `Itemize` environment’s bulleted lists to describe different points.
- An outline would use the `Enumerate` environment’s numbered lists (and lettered sublists).
- A document describing several software packages could use the `Description` environment, where each item in the list begins with a bold-faced word.
- The `List` environment — not found in L^AT_EX — is a slightly different form of `Description`.

Let’s write a list of reasons why L_YX is better than other word processors. Somewhere in your document, type:

`Lyx is better than other word processors because:`

and hit `Return`. Now select `Itemize` from the `Environment` menu. L_YX writes a “bullet” (actually, an asterisk, which will be converted to a round circle on output) on the line. Type in your reasons:

`Typesetting is done for you.`
`Math is WYSIWYG`
`Lists are very easy to create!`

List environments, unlike headings, do not end when you type `Return`. Instead, L_YX assumes you’re going on to the next item in the list. The above will therefore result in a three-item list. If you want more than one paragraph within one list *item*, one way is to use the `Protected Break`, which you get by typing `C-Return`. In order to get out of the list, you need to reselect the `Standard` environment (or just use the keybinding, `M-p s`).

You’ve got a beautiful itemized list. You might want to run L^AT_EX to see how the list looks when printed out. But what if you wanted to number the reasons? Well, just select the whole list⁷ and choose `Enumerate` from the `Environment` menu. Pow! As we mentioned, if you add or delete a list item, L_YX will fix the numbering.

While the list is still selected, you can change to the other two list environments, `Description` and `List`, in order to see what they look like. For those two environments, each list item is made up of a term, which is the item’s first word, followed by a definition, which is the rest of the paragraph (until you hit `Return`.) The term is either typeset in boldface (`Description`) or separated by a

⁶Yes, we’re overemphasizing this point throughout the *Tutorial*. But it *is* the main philosophy of L_YX, so please forgive us.

⁷L_YX won’t let you select the first bullet unless you also select the paragraph *before* the list, which you probably don’t want to do. Similarly, you can’t select the actual number in a numbered section title. Don’t worry about it.

“Tab”⁸ (List) from the rest of the paragraph. If you want to have more than one word in the definition, then separate the words with Protected Blanks.

Exercise: Typeset the list in `example_raw.lyx`

You can nest lists within each other in all sorts of interesting ways. An obvious example would be writing outlines. Numbered and bulleted lists will have different numbering and bulleting schemes for sublists. See the *User's Guide* for details on the different sorts of lists, as well as examples which use *a lot* of nesting.

2.2.3 Other Environments: Verses, Quotations, and More

There are two environments for setting quotations apart from surrounding text: `Quote` for short quotes and `Quotation` for longer ones. Computer code (the `LATEX-Code` environment, also used in the *Tutorial* for the long typing examples) is written in a `typewriter` font; this environment is the only place in `LATEX` where you're allowed to use multiple spaces to allow code indenting. You can even write poetry using the `Verse` style, using `Return` to separate stanzas, and `C-Return` to separate lines within a stanza. See the *User's Guide* for more complete descriptions of all of the available `LATEX` environments.

Exercise: Correctly typeset the `Quote`, `LATEX-Code`, and `Verse` in `example_raw.lyx`

⁸But a typesetter's tab, which will change to fit the size of the largest term, not a pathetic, rigid, unchangeable typewriter `Tab`.

Chapter 3

Writing Documents

The previous chapter hopefully allowed you to get used to writing in LyX. It introduced you to the basic editing operations in LyX, as well as the powerful method of writing with environments. Most people who use LyX, though, will want to write documents: papers, articles, books, manuals, or letters. This chapter is meant to take you from simply writing text with LyX to writing a complete document. It will introduce you to text classes, which allow you to write different sorts of documents. It will then describe many of the additions that turn text into a document, such as titles, footnotes, cross references, bibliographies, and tables of contents.

3.1 Text classes

Different sorts of documents should be typeset differently. For example, books are generally printed double-sided, while articles are single-sided. In addition, many documents contain special environments: letters contain some environments — such as the sender’s address and the signature — which do not make sense in a book or article. The LyX *text class*¹ takes care of these large scale differences between different sorts of documents. This *Tutorial*, for example, was written in the **Book** text class. Text classes are another major part of the WYSIWYM philosophy; they tell LyX how to typeset the document, so you don’t need to know how.

Your document is probably being written in the **Article** text class². Try changing to other text classes (using the **Document** ▷ **Settings** dialog) to see how they are typeset differently. If you change your document to the **Book** text class and look at the **Environment** menu, you’ll see that most of the allowed environments are the same. However, you can now use the **Chapter** environment. If you’re ever unsure about which environments you can use in a given text class, just consult the **Environment** menu.

¹L^AT_EX users: this is equivalent to the L^AT_EX document class

²That’s usually the default text class

Font sizes, one- or two-column printing, and page headings are just some of the ways journals' typesettings differ from one another. As the Computer Age continues to mature, journals have begun accepting electronic submissions, creating L^AT_EX "style files" so that authors can submit correctly typeset articles. LyX is set up to support this as well. For example, LyX supports typesetting (and extra environments) for the American Mathematics Society journals using the Article (AMS) text class.

Here's a very quick reference to some of the text classes. See the *Special Document Classes* section of the *Extended Features* manual for many more details.

Name	Notes
article	one-sided, no chapters
article (AMS)	layout & environments for American Math Society
report	longer than article, two-sided
book	report + front and back matter
slides	transparencies (also including FoilL ^A T _E X)
letter	lots of extra environments for address, signature...

3.2 Templates: Writing a Letter

One of the most popular text classes is **Letter**. One way to write a letter would be to open a new file, and choose **Letter** class in the **Document**▷**Settings** dialog. While this is the most obvious way to write a letter, it seems like extra work. Every time you write a business letter, you want to have your address, the address you're sending to, a body, a signature, etc. LyX therefore has a *template* for letters, which contains a sample letter; once you have a template, you can just replace a couple parts of the letter with your text each time you write a letter.

Open a new file with **File**▷**New from Template**. Select `letter.lyx` as the template. Save and print the file to see how the various environments are typeset.

When you look at the **Environment** menu, you'll see several environments, like the **My Address** environment, which don't even exist in most other text classes. Others, like **Quote** and **Description**, are familiar. You can play around for a while to figure out how the various environments work. You'll notice for example that the **Signature** environment has the word "Signature:" in red before the actual text of the signature. This word doesn't show up in the actual letter, as you'll see if you try printing the file. It's just there to let you know where the signature goes. Also, note that it doesn't matter where in the file the **Signature** line is placed. Remember, LyX is WYSIWYM; you can put the **Signature** environment anywhere you want, but LyX knows that in the printout, the signature should be at the end.

A template is just a regular LyX file. This means you can fill in your address and signature and save the file as a new template. From now on, any time you

want to write a letter, you can use the new template to save time. We probably don't have to suggest an actual “exercise” here; just write a letter to someone!³

Templates can be a huge time-saver, and we urge you to use them whenever possible. In addition, they can help a person learn how to use some of the fancier text classes. Finally, they may be useful for a person who is configuring LyX for a bunch of less computer-aware users. When they're first learning LyX, it will be much less intimidating if they have a letter template customized for their company, for example.

3.3 Document Titles

LyX (like L^AT_EX) considers the title — which may contain the actual title, the author, the date, and even an abstract of a paper — to be a separate part of the document.

Go back to your `newfile.lyx` document and make sure it's using the `Article` text class.⁴ Type a title on the first line, and change the line to the `Title` environment. On the next line, type your name and change it to the `Author` environment. On the next line, write the date in the `Date` environment. Type a paragraph or two summarizing your document using the `Abstract` environment. Notice how the title is presented when it's printed out. If you changed the document format to `Book`, you'll get a separate title page, like the first page of this tutorial.

Exercise: Fix the title, date, and author in `example_raw.lyx`

3.4 Labels and Cross-References

You can label a section (or subsection, or, more rarely, just a random piece of text) in your document. Once you do so, you can refer to this section in other parts of the document, using cross-references. You can refer either to the section's number, or to the page that the section appears on. As with sections and footnotes, LyX worries about the cross-references for you. Automatic labels and cross-references are one of the best advantages of LyX (and L^AT_EX) over conventional word processors.

Your first label

Let's mark our second section, whose title is “About This Document”. Click at the end of the section title line, and select `Insert > Label`. A dialog asks you for a

³One warning, if you're writing from a template. If you erase all of the text in an environment — for example, if you erase the whole `My Address` field so that you can replace it with your own — and then you move the cursor without writing any text, the environment may disappear. This is because most environments cannot exist without any text in them. Just reselect the environment from the `Environment` menu to get it back.

⁴You should not be using the letter any more, since the `Letter` textclass doesn't allow titles.

label name, and gives you a suggestion. When you click on OK, the label name will be placed in a box next to the section title.

By the way, you could have put the label right anywhere within the section as well; section references will refer to the last section or subsection whose heading comes before the label. However, putting it on the same line as the section title (or, perhaps, on the first line of the section’s text) ensures that page references will reference the beginning of the section.

So far you haven’t done anything — the dvi file will look exactly the same, since labels don’t show up in the printed document. However, now that you’ve added a label, you can refer to that label with cross-references. We’ll do that next.

Your first cross-references

Place the cursor somewhere in Section 2 of your document. Type

```
If you want to know more about this document, then see
Section , which can be found on page .
```

Now — with the cursor after the word “section” — choose `Insert > Cross Reference`. The Reference dialog pops up. It shows a list of the possible labels you can reference. At the moment, there should be only one, “sec:aboutdocument”. Select it (it may be selected by default), and click Apply. Now put the cursor after the word “page”, and change the reference type to use the page number then click Apply. (To be really correct, you should put a Protected Blank in between the word “Section” and the reference. Same for the page reference.)

L^AT_EX puts the references in a box right where the cursor was. In the printed document, this reference marker will be replaced with either the page or section number (depending on what you selected in the Reference dialog). Use `View > Update > DVI`, and you’ll see that on the last page we refer to “Section 2” and “Page 1” (or whatever page Section 2’s title is on).

Conveniently, a cross-reference acts a hyperlink when you’re editing a document in L^AT_EX; clicking on it will pop up the Reference dialog, clicking Go to Label will move the cursor to the referenced label.

More fun with labels

We told you that L^AT_EX worries about numbering cross-references; now you can test that. Add a new section before Section 2. Now rerun L^AT_EX, and — voilà! — the section cross reference changed to “3”! Change “About this Document” to a subsection, and the cross-reference will reference Subsection 2.1 instead of Section 3. The page reference won’t change unless you add a whole page of text before the label, of course.

If you want some more practice with labels, then try putting a new label where your first cross-reference was, and refer to that label from elsewhere in the document. If you’ll be inserting cross-references often (if, for example, you’re

writing a journal article), it may be convenient to leave the Reference dialog open.

If you want to make sure that the cross-referencing gets the pages right even for larger documents, Copy a couple pages of text from the *User's Guide* to the clipboard, and Paste the stolen text into your document⁵.

Exercise: Fix the references in `example_raw.lyx`

3.5 Footnotes and Margin Notes

Footnotes can be added using the Insert Footnote button in the toolbar⁶ or `Insert > Footnote`. Click at the end of the word “LyX” somewhere in your document and hit the Insert Footnote button. A footnote box appears where you can enter the text of the footnote. LyX should place the cursor at the beginning of the footnote box. Type

LyX is a typesetting word processor.

Now click on the button labelled “foot.” The footnote box disappears, leaving the button showing where the footnote marker will be in the printed text; this is called “folding” the footnote. You can unfold the footnote at any time — and re-edit its text, if you want — by clicking again on the “foot” button.

You may wonder why the footnote button is a word instead of a number. The answer is that LyX worries about the footnote numbering for you in the printed text. You can see this yourself by looking at the dvi file (or printout). If you add other footnotes, LyX will renumber the footnotes. Since LyX (well, L^AT_EX, actually) takes care of the footnote numbering, there's really no need to put the numbers in the LyX file.

A footnote can be cut and pasted like normal text. Go ahead; try it! All you need to do is select the footnote button⁷ and Cut and Paste it. In addition, you can change regular text to a footnote, by selecting it and hitting the Insert Footnote button; change a footnote to regular text by clicking the Insert Footnote button when the cursor is in a footnote.

Margin notes can be added using the toolbar button (the button shows an arrow pointing to red text next to (i.e., in the margin of) black text, and should be next to the Insert Footnote button in the toolbar.) or `Insert > Marginal Note`. Margin notes are like footnotes, except that:

- the on-screen boxes say “margin” instead of “foot”
- the notes will be placed in the margin, instead of below the text

⁵By the way, copying a chapter title may cause an error, because chapters aren't allowed in the article class. If this happens, just delete the chapter title. If you want to know why this happens, see Section 3.1.

⁶The button shows an arrow pointing to red text, which is just below some black text.

⁷It may be easier to select it using the keyboard. You might accidentally open the footnote if you're trying to select the marker itself with the mouse.

- margin notes are not numbered

Change your LyX footnote back to text, then select and change it to a margin note. Run L^AT_EX again to see what the margin note looks like.

Exercise: Fix the footnote in `example_raw.lyx`

3.6 Bibliographies

Bibliographies (at least in the exact sciences) are similar to cross references. The bibliography contains a list of references at the end of the document, and they can be referenced from within the document. Like section titles, LyX and L^AT_EX make your job easier by automatically numbering the bibliography items and changing citations when the items' numbers change.

Go to the end of the document and switch to the Bibliography environment. Now, each paragraph you type will be a reference. Type `The Lyx Tutorial`, by the LyX Documentation Team as your first reference. Note that LyX automatically puts a number in a box before each reference. Click on the boxed reference number, and a Bibliography item dialog box appears. You use the first field, the Key, to refer to this reference within the LyX document. By default, it is a number. Change the Key field to “lyxtutorial” to make it easy to remember.

Now pick somewhere in your document that you would like to insert a reference. Do so with `Insert > Citation`. A Citation dialog appears. The right panel in this dialog lists all the bibliography entries, and this field allows you to choose which bibliography item you want to cite. Select “lyxtutorial” (right now, that’s the only item in the bibliography), then use the left arrow in the center to insert it. (You can have multiple citations in the same place by transferring a number of keys this way.) Now run L^AT_EX, and you’ll see that the citation appears in brackets in the text, referring to the bibliography at the end of the document.

How are the other fields used? The `Text after` field in the Citation dialog will put a remark (such as a reference to a page or chapter within the referenced book or article) in the brackets after the reference. If you want the references to have labels instead of numbers in the printed output (for example, some journals would use “[Smi95]” to refer to a paper written by Smith in 1995), use the `Label` field in the Bibliography Entry Settings dialog. As usual, you can see the *User’s Guide* for details.

Exercise: Fix the bibliography and citation in `example_raw.lyx`

3.7 Table of Contents

You may want to put a table of contents at the beginning of your document. LyX makes this very easy to do. Just hit `Return` after your document title and before your first section title and choose `Insert > List / TOC > Table of Contents`. The words “Table of Contents” will appear in a button on the first line of the document.

This may not appear to be very useful. However, if you look at your `dvi` file, you will see that a table of contents has been generated, listing the various sections and subsections in your document. As usual, if you reorder sections or create new ones, you will see those changes in the `dvi` file when you update it.

The table of contents is not printed in the on-screen version of the document, because you can't edit it anyway. However, you can display the table of contents in a separate window by clicking on the table of contents button, or by using Document ▷ Table of Contents. The menu command will work even if you don't have a table of contents inset in your document. This is a very useful tool. You can use the Table of Contents window to move around your document. Clicking on a (sub)section title in the Table of Contents window will highlight that line and move the cursor (in the LyX editing window) to that place in the document. You can also use the arrow keys to move up and down in the table of contents. You may therefore find it convenient to leave this window open throughout editing sessions. You can get similar functionality from the Navigate menu, though, where the table of contents appears automatically.

To get rid of the Table of Contents, you can delete the table of contents button just like any other text.

Exercise: Fix the table of contents in `example_raw.lyx`

Chapter 4

Using Math

L^AT_EX is used by many scientists because it outputs great looking equations, avoiding the control characters used by word processors and their equation editors. Many of these scientists are frustrated, however, because writing equations in L^AT_EX is more like programming than writing. Happily, L_YX has WYSIWYM support for equations. If you are used to L^AT_EX, you'll find that all of the usual L^AT_EX math commands can be typed in normally, but they will show up in a WYSIWYM fashion. If, on the other hand, you've never written in L^AT_EX, then the Math Panel will allow you to write professional-looking math quickly and easily¹.

4.1 Math Mode

Somewhere in your L_YX document, type:

```
I like what Einstein said, E=mc^2, because it's so simple.
```

Now, that equation doesn't look very good, even in the dvi file; there's no space between the letters and the equals sign, and you'd like to write an actual superscript for the "2". That bad typesetting happened because we didn't tell L_YX that we were writing a mathematical expression, so it typeset the equation like regular old text.

Instead, we create a formula that will get typeset properly. In order to create a formula, just click the toolbar button with $\frac{a+b}{c}$ written on it in blue. L_YX will insert a little blue square, which is an empty math formula. L_YX has placed the cursor in the blue square, so just type E=mc² again. The expression is typed in blue, and the blue square disappears as soon as the formula is not empty. Now type Esc to leave the equation. The purple markers disappear, leaving the cursor to the right of the expression, and now if you type something, it will be regular text.

¹L_YX can't check if the math you're writing is actually *correct*. Sorry.

Run \LaTeX and look at the `dvi` file. Notice that the expression was typeset nicely, with spaces between the letters and the equals sign, and a superscript “2”. Letters in math mode are assumed to be variables, and come out in italics. Numbers are just numbers.

This math editor is another example of the WYSIWYM philosophy. In \LaTeX , you write a mathematical expression using text and commands like `\sqrt`; this can be frustrating, because you can’t see what an expression looks like until you \LaTeX the file, and may have to spend time to find missing brackets or other “bugs”. On the other hand, \LyX doesn’t attempt to get the expression to look perfect (WYSIWYG), but it gives you an extremely good idea of what the expression will look like. \LaTeX then takes care of the professional typesetting. 99% of the time, you won’t have to make any changes to the font sizes or spacing that \LaTeX outputs. This way (sorry to be so repetitive) you can focus on the *content* of your mathematical expressions, not their format.

4.2 Navigating an Equation

Now let’s change $E = mc^2$ to $E = 1 + mc^2$. Use the arrow keys to move the cursor into the expression. Note that when you enter the expression, the purple markers appear to let you know you’re editing math. Now you can use `Left` and `Right` to move the cursor past the equals sign, and just type “1+”. Again, you can use the arrow keys or `Esc` to leave the formula.

Other than the special keys described below, typing in math mode is like editing regular text. Use `Delete` (or `Backspace`) to delete things. Select text either with the arrow keys or with the mouse. `Edit` \triangleright `Undo` works in math mode, as does cutting and pasting. One thing to be careful of: if you’re right outside a formula and you type `Delete` (or `Backspace`), it will delete the whole expression. Luckily, you can just use `Undo` to get it back.

What if you want to change $E = mc^2$ to $E = mc^{2.5} + 1$? Again, you can use the mouse to click in the right place. However, you can also use the arrow keys. If the cursor is just after the “c” but before the “2”, then typing `Up` will move the cursor to the level of the superscript, just before the “2”. Add the “.5”. Now, hitting `Down` will move the cursor back to the regular level. In fact, if you hit `Down` from anywhere within the superscript, the cursor will be placed just *after* the superscript (so that you can then type the “+1”).

4.3 Exponents and Indices

An exponent can be entered from the Math Panel (see below), but it’s actually simpler just to type the caret key, “^”. \LyX will place another blue rectangle in the superscript, so that whatever you write next will be superscripted, and in a smaller font size. Everything you type until you hit a `Space` (or `Esc` to exit Mathed entirely) will be in the superscript.

Writing a subscript (index) is just as easy — start one by typing the underscore key, “_”. You can subscript and superscript both subscripts and superscripts like this: $A_{a_0+b^2} + C^{a_0+b^2}$.

Exercise: Put equation 1 of `example_raw.lyx` into math mode.

4.4 The Math Panel

The Math Panel is a convenient way to enter symbols or to perform many complicated Mathed functions. Many of these functions can be accomplished from the keyboard or the `Edit▷Math` or `Insert▷Math` menus. However, we’re going to concentrate on using the Math Panel, just to let you know what’s out there; you can learn keyboard shortcuts later, from other manuals. So open it using `Insert▷Math▷Math Panel` now and leave it open while reading this section.

Right-clicking on a formula will open the Math Panel for you.

4.4.1 Greek and symbols

The Math Panel which allow you to choose from a large array of symbols used in math: various arrows, relations, operators, and sums and integrals. Note that subscripting and superscripting allow you to put lower and upper limits on sums and integrals.

“Nothing you can do that can’t be done... All you need is ♡.”

4.4.2 Square roots, accents, and delimiters

To type a square root, just click on the button with a square root sign on it. The square root appears, and the cursor is in a new insertion point inside the square root. You can type variables, numbers, other square roots, fractions, whatever you want. L^AT_EX will automatically resize the square root to fit what’s inside.

Accenting a character (\vec{v}) or group of characters ($\overline{a+b}$) is done the same way. The Decoration types are available from the panel. Click on a decoration, and L^AT_EX will insert that decoration with an insertion point under (or over) it. Just type what you want in the insertion point. There are two sets of decorations: those that resize with the text you type, and those that have fixed size, and are most appropriate for a single letter.

Delimiters such as parentheses, brackets, and braces work similarly, but are a bit more complicated. Hit the Delimiter button, which features a blue square surrounded by brackets, to pop up the Delimiter dialog. Your current selection of delimiters is displayed in a box. It’s a pair of parentheses by default, but you can choose a pair of braces, a brace and a parenthesis, or even choose the empty square to have something like “ $a = \langle 7 \rangle$ ” (the empty delimiter is displayed as a broken line in L^AT_EX, but won’t show up in the output).

If you’re lazy, you can type actual parentheses in math mode, rather than using the Delimiter window. However, those parentheses will be the same size

as regular text, which will look bad if you have a big fraction or matrix inside the parentheses. Using the Delimiter window will guarantee that the delimiters are sized based on what's inside them.

You can also put delimiters or a square root sign or a decoration on already existing text. Select the portion of the formula that you want to adjust, and then click on the button you want from the Math Panel. Try using this to change Newton's second law from scalar to vector form ($f = ma$ to $\vec{f} = m\vec{a}$). Once you've learned about matrices, this is how you'll put parentheses or brackets around them.

4.4.3 Fractions

Fractions are very simple in Mathed. Just click on the Fraction button in the Math Panel, which shows a fraction with blue squares in the numerator and the denominator. LyX writes two insertion points in a fraction. As you would expect, you can use arrow keys or the mouse to move around a fraction. Click on the top square and type "1". Now hit Down and type "2". You've made a fraction! Of course you can type anything within each of the two boxes: variables with exponents, square roots, other fractions, whatever.

Exercise: Put equation 2 of `example_raw.lyx` into math mode.

4.4.4 TeX mode: Limits, log, sin and others

Because letters in math mode are considered to be variables, if you type "sin" in math mode, LyX thinks you're typing the product of the three variables s , i , and n . The three letters will be typeset in italics, when what you really wanted was the word "sin" typeset in Roman. In addition, LyX won't put a space between the word "sin" and the "x" (typing Space will just exit math mode). So how do you get "sin x " instead of " $sinx$ "?

Click on "sin" in the Functions list in the Math Panel. The word "sin" is written in black, in upright roman type. The whole word is treated as one symbol, so if you type Backspace, it will delete the whole word. Now type "x", which will be written in blue italics, like you expect in Mathed. In the dvi file, the expression will be correctly typeset. Try it.

Other commands you need to type in TeX mode using the Functions box include other trigonometric functions and their inverses, hyperbolic functions, logarithms, limits, and quite a few others. These functions can take subscripts and superscripts, important for typing " $\cos^2 \theta$ " or " $\lim_{n \rightarrow \infty}$ ".

Exercise: Put equation 3 of `example_raw.lyx` into math mode.

4.4.5 Matrices

Click on the Matrix button in the Math Panel. The dialog has two sliding bars which allow you to choose how many rows and columns you want in your matrix. Choose 2 rows and 3 columns and hit Apply or OK. LyX prints 6 insertion points in a 2×3 matrix. As usual, you can put any sort of Mathed expression (a square

root, another matrix, etc.) in each insertion point. You can also leave some of the insertion points empty if you want.

Tab can be used to move horizontally between the columns of a matrix. Alternatively, you can use the arrow keys to move around - hitting **Right** at the end of one box will move to the next box, **Down** will move to the next row, etc.

If you suddenly need more rows or columns, use **Edit** ▸ **Math** ▸ **Add Row** and **Add Column**. They add a row or column just after the current position. Overdid it? Use **Delete Row** and **Delete Column** from the same menu.

See the *User's Guide* for information on how to change the horizontal alignment of each column, and how to change the vertical position of the whole matrix. Note that if you want to write a table containing text, you should use LyX' wonderful table support, rather than trying to write text in a matrix.

4.4.6 Display mode

All of the expressions we have written so far have been on the same line as the text that came before and after them, otherwise known as inline expressions. This is fine for short, simple expressions, but if you want to write larger ones, or if you want your expressions to stand out from the text, you need to write them in display mode. In addition, only displayed expressions can be labeled and numbered (see the *User's Guide*), and multi-line equations (see Sec. ??) must be in display mode.

Click on the **Display** button in the **Math Panel**, which represents a couple lines of text before and after a centered blue box. LyX inserts a formula, but the insertion point is on a new line, and it's centered within that line. Now type an expression and run **L^AT_EX** to see how it looks. The **Display** button is actually a toggle; use it now to change a couple of your expressions to display mode and back.

Display mode has a couple differences from inline mode:

- The default font is larger for a few symbols, like \sum and \int
- Subscripts and superscripts for limits and sums (but not integrals) are written under rather than next to the symbols
- Text is centered

Other than these differences, though, displayed expressions and inline expressions are very similar.

One final note about the way displayed formulae are typeset: be careful about whether you're putting your equation into a new paragraph or not. If your formula is in the middle of a sentence or paragraph, then don't press **Return**. Doing so will cause the text *after* the formula to start a new paragraph. That text will therefore be indented, which is probably not what you want.

Exercise: Put the various equations in `example_raw.lyx` into display mode, and see how they're typeset differently.

Exercise: Using various tools you’ve learned in this section, you should be able to write an equation like²:

$$f(x) = \begin{cases} \log_8 x & x > 0 \\ 0 & x = 0 \\ \sum_{i=1}^5 \alpha_i + \sqrt{-\frac{1}{x}} & x < 0 \end{cases}$$

4.5 More Math Stuff

Mathed can do plenty more. By now, you’re familiar with the basics, so we’ll just refer to the *User’s Guide* for tips on how to:

- Labeling and numbering expressions
- Multi-line equations
- Change typefaces, e.g., to write bold-face text in an expression.
- Fine-tune font sizes and spacing within an expression. (Don’t worry about this until your final draft!)
- Write macros. These are very powerful, because you just define them once at the top of the document, and then you can use them throughout the document. If you change the macro definition, the references to the macro will be changed throughout the document. Macros can even take arguments.
- Do lots of other things we didn’t have time to mention in this *Tutorial*.

²After you’ve done it the hard way, why don’t you give `Insert▷Math▷Cases` environment a try?

Chapter 5

Miscellaneous

5.1 Other Major L_YX Features

We haven't gone through all the possible commands in L_YX, and we aren't planning on it. As usual, see the *User's Guide* for more information. We'll just mention a couple more major things L_YX can do...

- L_YX has WYSIWYM support for tables. Use the **I**nsert▷**T**able to get a table. Click on the table with the *right button* to get a **T**able **S**ettings dialog box which allows extensive table editing.
- L_YX also supports including pictures in a number of formats (including JPEG and other bitmap formats, PostScript® and raw L^AT_EX) within documents. (You guessed it: **I**nsert▷**G**raphics. Then click on the figure to choose the file to include, rotate or scale it, etc.) Tables and figures can have captions, and L_YX will automatically generate lists of figures and/or tables.
- Version control is supported, using RCS (`man rcsintro` for more info).
- L_YX is heavily configurable. Everything from how the L_YX window looks to how the output comes out can be configured in a number of ways. Much configuration is done through **T**ools▷**P**references. For more information on this, check out **H**elp▷**C**ustomization.
- L_YX is being developed by a team of programmers on five continents. Therefore, L_YX has better support for non-English languages (such as Dutch, German, French, Greek, Czech, Turkish, ...) than many word processors. Even some right-to-left languages like Hebrew or Arabic are supported. You can write documents in other languages, but you can also configure L_YX to show its menus and error messages in other languages.
- The L_YX menus feature keybindings. This means that you can do **F**ile▷**O**pen by typing M-F followed by O or by using the binding which is shown

next to it in the menu (C-O by default). Keybindings are also configurable. For information on this, check out [Help](#)▷[Customization](#).

- LyX can read in L^AT_EX documents. See Section 5.2.2.
- Spellchecking and thesaurus facilities are available.
- The text box near the bottom of the LyX window is called the minibuffer (after a similar feature in `emacs`). This gives you access to all sorts of interesting functionality, including functionality which could break your document. In other words, don't type in the minibuffer unless you know what you're doing.

5.2 LyX for L^AT_EX Users

If you don't know anything about L^AT_EX, you don't have to read this section. Actually, you might want to *learn* about L^AT_EX, and then read this chapter. However, many people who begin to use LyX will be familiar with L^AT_EX. If you are such a person, you may be wondering if LyX can really do everything L^AT_EX can do. The short answer is that LyX can do pretty much everything L^AT_EX can do in one form or another, and it definitely simplifies most parts of writing a L^AT_EX document. The tool that is used to convert a L^AT_EX document to LyX was rewritten completely for LyX 1.4. It should now be able to handle most L^AT_EX gracefully.

Because this is just a tutorial, we are only going to mention things that new LyX users will most likely be interested in. In the interests of keeping the *Tutorial* short, we will give only minimal information here. The *Extended Features* manual, specifically the *Secrets of the L^AT_EX Masters* chapter, has a great deal of information on differences between LyX and L^AT_EX, and how to do various L^AT_EX tricks in LyX.

5.2.1 T_EX Mode

Anything that you enter in T_EX mode will be passed straight to L^AT_EX, and will be displayed in red on the screen. You can use T_EX commands in LyX by choosing [Insert](#)▷[T_EX Code](#). This creates a text box, and everything within it is passed straight to L^AT_EX.

In a math formula, T_EX mode is handled a bit differently. Enter T_EX mode by typing a backslash. The backslash is not written out, but anything you type afterwards will be in red. You exit T_EX mode by typing `Space` or some other non-alphabetic character, like a number, underscore, caret, or parenthesis. Once you exit T_EX mode, if LyX knows the T_EX command you've typed in, it will convert it to WYSIWYM. So if, in a formula, you type `\gamma`, then when you type `Space`, LyX will change the red "gamma" to a blue "γ". This will work for almost all, non-complicated math macros. This may be faster than using the [Math Panel](#), and will be especially convenient for experienced L^AT_EX users.

As a special case, if you type a brace in T_EX mode, then the beginning *and* ending braces will be inserted in red, then take you *out* of T_EX mode and place the cursor between the braces. This makes it more convenient to type commands that L_YX doesn't know which take an argument.

L_YX can't do absolutely everything that L^AT_EX can do (yet?). Some fancy functions are not supported at all, while some work but aren't WYSIWYM. T_EX mode allows users to get the full flexibility of L^AT_EX, while having all the convenient features of L_YX, like WYSIWYM math, tables, and editing. L_YX could never support every L^AT_EX package. However, by typing `\usepackage{foo}` in the preamble (see Section 5.2.4.2), you can use any package you want — although you won't have WYSIWYM support for that package's features.

5.2.2 Importing L^AT_EX Documents — tex2lyx

You can import a L^AT_EX file into L_YX by using the `File > Import > LATEX` command in L_YX. This will call `tex2lyx` which will create a file `foo.lyx` from the file `foo.tex` — and then open that file. If the translation doesn't work, you can try calling `tex2lyx` from the command line, possibly using fancier options.

`tex2lyx` will translate most legal L^AT_EX, but not everything. It will leave things it doesn't understand in T_EX mode, so after translating a file with `tex2lyx`, you can look for red text and hand-edit it to look right.

`tex2lyx` has its own manpage. Read it to find out about which L^AT_EX commands and environments aren't supported, bugs (and how to get around them), and how to use the various options.

5.2.3 Converting L_YX Documents to L^AT_EX

You might wish to convert a L_YX Document to a L^AT_EX file. For example, a co-worker or co-author who doesn't have L_YX might want to read it. This is very easy to do with L_YX. Select `File > Export > LATEX`. This will create a file `whatever.tex` from the `whatever.lyx` file you are editing. L_YX always creates temporary L^AT_EX files when viewing or printing files, so it is very good at generating L^AT_EX.

5.2.4 L^AT_EX Preamble

5.2.4.1 Document Class

The `Document > Settings` dialog takes care of many of the options that you would input in a `\documentclass` command. Change the class, default font size and paper size here. Put any extra options to the `\documentclass` command in the `Extra Options` area.

5.2.4.2 Other Preamble Matter

If you have special commands to put in the preamble of a L^AT_EX file, you can use them in a L_YX document as well. Select `Document > LATEX Preamble` and

type in the dialog window (or from the document settings dialog, depending on the frontend). Anything you type will (like with \TeX mode) be sent directly to \LaTeX .

5.2.5 Bib \TeX

\LyX has support for Bib \TeX , which allows you to build databases of bibliographical references to be used in multiple documents. Select **Insert** \triangleright **List / TOC** \triangleright **Bib \TeX Reference** to include a `bib` file. Click on the resulting “Bib \TeX Generated References” button, and you will get a Bib \TeX dialog. In the **Database** field, type what you would type inside the braces of a `\bibliography{}` command¹. Similarly, in the **Style** field, type what you would type inside the braces of a `\bibliographystyle{}` command.

After you’ve done this, you can use citations from any bibliographies you’re including with **Insert** \triangleright **Citation** (see Section 3.6). \LyX will take care of running Bib \TeX . The box in the Citation dialog will show a list of all the references in your `bib` file.

5.3 Errors!

Sometimes when you \LaTeX a document, there will be errors, things that \LyX or \LaTeX can’t understand. When this happens, \LyX will open a \LaTeX Errors dialog. Clicking on individual errors in this dialog will take you to the place in the \LyX document where the error occurs and also display the detailed \LaTeX error message.

¹Like in regular \LaTeX , multiple bibliographies should be separated by commas, with no whitespace.