

Typesetting in LaTeX: Getting Started

by Scott Gilbert
Southern Illinois University, Carbondale

Copyright ©2005, all rights reserved

April 2005

Notes: Electronic versions of this document (in .tex, .txt, .dvi, .ps and .pdf formats) are available for download at the website www.siu.edu/~gilbert/latex.html. I thank Sajal Lahiri, Daniel Primont, and the graduate students of the Economics Department at Southern Illinois University Carbondale for helpful feedback on this tutorial. Further comments are most welcome, please contact me at gilberts@siu.edu.

Motivation: In economics and other quantitative disciplines, research papers often contain mathematical formulas and symbols. When there are many such formulas and symbols in a single paper, use of ordinary word processing software (such as Microsoft Word) can be time-consuming and very tedious. In such cases dedicated mathematical typesetting software is relatively convenient and produces results of high quality. **LaTeX** is a popular form of mathematical typesetting software¹, with free versions available for desktop computers running the Microsoft Windows operating system.

Objectives: This brief tutorial will show you how to acquire and set up a version of LaTeX on your own desktop computer. It will also give some simple examples of how to write LaTeX documents, including the document you are reading right now.

Requirements: I assume that you have a computer running Microsoft Windows (Windows 95/98/2000/XP), and have access to the internet. Ideally, your internet access will be via cable (high-speed), but a dial up connection (56K) is also OK. Your computer will need at least 30 megabytes of free storage space - a modest requirement. If you want to output your LaTeX documents to PDF (.pdf) format you will need a PDF reader such as Adobe Acrobat Reader 7.0², but you may have this on your computer already. Similarly, if you want to output your LaTeX documents to Postscript format you will need a Postscript rendering software like Ghostscript³.

¹See www.latex-project.org for an exhaustive description of LaTeX.

²The Adobe Acrobat reader is available for free download at www.adobe.com/products/acrobat/readstep2.html.

³You can download Ghostscript for free at www.cs.wisc.edu/~ghost.

Getting Started

To get LaTeX running on your computer we will go to the internet, download two computer programs, then set up the programs on your computer. The two programs are called **MiKTeX** and **TeXnicCenter**. MiKTeX includes a version of the LaTeX typesetting program, and TeXnicCenter is a convenient user interface for accessing the MiKTeX functionality. You use TeXnicCenter as the front end to your typesetting, and MiKTeX as the back end. Both of these programs are currently free for your own personal use. Download the two programs, as follows:

Download

1. First download MiKTeX. Using your computer's internet browser⁴, go to:

www.miktex.org/setup.html

At the top of this page you should see the message: “To install a basic MiKTeX system, download and run the “Small MiKTeX” installer: [small-miktex-2.4.1705.exe](#) (24 MB).”⁵ The underlined text is a hyperlink, click on this link with your computer mouse. You should then find yourself on a download server page. Choose a download location close to you, and click on the download button for this location. This begins the download of the file `small-miktex-2.4.1705.exe`. The file is quite large - about 24 megabytes - and will take hours to download on a dial-up connection. For this reason, if you have dial-up you'll have to be patient or instead download at a location with a faster connection.⁶ As the download begins try to write down the target directory on your computer, in which the file going to be saved. If download completes and you can not find where it has been stored, search your computer⁷ for the filename `small-miktex-2.4.1705.exe`.

2. Next download TeXnicCenter. Point your web browser to:

www.sourceforge.net/projects/texniccenter

⁴such as Internet Explorer or Mozilla FireFox

⁵You may see a slightly different message, and the executable file [small-miktex-2.4.1705.exe](#) may be updated to something like [small-miktex-3.9.4000.exe](#). The same methods apply in any case.

⁶If you download at a remote location you can save the downloaded file to a CD or other portable storage device, then bring the device to your location.

⁷In Windows, you can search for files by going to the Start menu on the desktop, then selecting the search feature.

Midway down the web page you should see “Latest File Releases”. Click download on the TeXnicCenter⁸ package. Make sure to click **download**, not the hyperlinked word TeXnicCenter. You should then be at the TeXnicCenter file list page. Click on the executable (.exe) file, which should be called something like TXCSetup_1Beta6_21.exe. This is a 5 megabyte file, so will take some minutes to download on a dialup internet connection (but you can download remotely, see above). Note the directory in which the file is downloaded.

If you succeeded in the last two steps then you now have MiKTeX and TeXnicCenter on your desktop computer.

Setup

To get the MiKTeX and TeXnicCenter programs running on your computer, you will need to execute them.

1. Find your downloaded MiKTeX executable file on your computer⁹, and click on it with your mouse. The MiKTeX Setup Wizard should start. You can choose the default setup by clicking Next on the subsequent prompts. After completing these prompts, the Wizard should complete installation of MiKTeX. The installation may take 5 minutes or more to complete.
2. Find your downloaded TeXnicCenter executable file on your computer, and click on it with your mouse. The TeXnicCenter Setup Wizard should start. You can choose the default setup by clicking Next on the subsequent prompts. Click the button next to the “I accept agreement” option, to accept the software’s licensing agreement, then click next through subsequent prompts if you wish to accept the default installation. Click “Install” on the last prompt. The Wizard should then complete installation of TeXnicCenter.

After completing the last step you should see a TeXnicCenter icon on your desktop. Click on this icon. The TeXnicCenter program should then start. You will be prompted to accept the “Tip of the Day” feature: You can accept this, it is a handy set of hints for beginners. Next, you will see the Configuration Wizard: Click Next to accept the first default; then click the button next to: “yes, configure TeXnicCenter for use with MiKTeX”; then click Next; then click Finish.

⁸There may be another downloadable file - TeXnicCenter system update, do not choose this file unless you first run into trouble with the basic TeXnicCenter download.

⁹In Windows, use your mouse to navigate to My Computer, and within My Computer navigate to the file.

Congratulations, you now have an installation of LaTeX working on your desktop computer! As a matter of style, you will see a big empty box on the left part of your screen - if you click on the black “x” it will make this empty box go away.

Orientation

Within the TeXnicCenter environment there is a set of convenient tools for LaTeX typesetting. To learn TeXnicCenter you need to know what it itself provides - an interface or ‘front end’ to your back end LaTeX server, and also what is provided by your back-end MiKTeX software. The Help menu (upper right on the top menu bar) contains, under the contents listing, a guide to both TeXnicCenter features and also a separate guide to the LaTeX typesetting language. You will use the LaTeX language to write source documents with names like `mydoc.tex` or `econ.tex`, and the MiKTeX back-end program will compile or ‘build’ your source document into an output file such as `mydoc.dvi`, `mydoc.pdf`, `econ.dvi` or `econ.pdf`.

The TeXnicCenter help menu does not cover LaTeX implementation details specific to your MiKTeX software, but unless you are a very advanced user you do not need to know how MiKTeX actually works, only that it is correctly installed and operating on your computer. Further details about both TeXnicCenter and MiKTeX are available at their respective on-line home pages www.sourceforge.net/projects/texniccenter and www.miktex.org.

An engaging way to get further immediate exposure to information about LaTeX typesetting is to type in your web search engine box a phrase like ‘LaTeX typesetting’, or ‘LaTeX software tutorial’ or ‘using LaTeX with TeXnicCenter’. Even for seasoned LaTeX users, web search is a great way to find detailed information on special LaTeX methods and tools.

As a starting point on web resources for LaTeX users, see the TeX users group www.tug.org and the handy on-line tutorial:

www.comp.leeds.ac.uk/andyr/misc/latex/latextutorial1.html

For a longer tutorial, see “The Not So Short Introduction to LaTeX 2E”, at:

<ftp://ftp.tex.ac.uk/tex-archive/info/lshort/english/lshort.pdf>

Book-length guides to LaTeX include:

- A Guide to LaTeX2e, by Helmut Kopka and Patrick Daly (Addison-Wesley, ISBN 0-321-17385-6, fourth edition, 2003).
- The LaTeX Companion, by Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, and Chris Rowley (Addison-Wesley, ISBN 0-201-36299-6, second edition, 2004).

Creating a document

Creating documents via LaTeX requires that you enter (via keyboard and perhaps some mouse-guided menus) some LaTeX typesetting commands, in addition to the desired text of your document. The combination of your regular text and the LaTeX commands is the LaTeX **markup** that forms the source of your LaTeX documents. In the same way, web pages typically have an HTML source file consisting of text and commands which together form valid HyperText Markup Language (HTML).

Because the creation of LaTeX markup involves a certain amount of specialized technical language, it takes some practice to learn. Fortunately, you can make some very simple LaTeX files yourself, without much effort, using the basic steps that we next describe.

1. Create a new document and enter your LaTeX markup content, including LaTeX commands, text, math, drawing constructions, and calls to imported objects such as graphics, into the Input Window. Save the content as a file.
2. Build the Output for the current file. To build, click on the Build icon just to the left of the Output Profile text box, or press Cntl+F7, or use the Build menu on the top menu bar. You have a choice of output formats, displayed in the Output Profile box¹⁰. The LaTeX => DVI option is most convenient for use in LaTeX editing, but the LaTeX => PDF option creates PDF documents useful when where you want to send the completed output file electronically to both LaTeX users and non-LaTeX people. If you have labeled equations or other complex features in your markup, you'll want to build your document twice - by clicking Build twice. After you Build your Output, you'll see an output Report in the bottom viewing window. This Report tells you about any errors or issues that LaTeX discovered in your markup when Building the Output.
3. View the Output, by clicking on the View Output icon just to the right of the Build icon, or press F5.

After you have viewed the output, you can return to the Input Window by double-clicking in the Output Window at that position in the document to which you want to return. Alternatively, you can close or minimize the Output Window.

EXAMPLE 1: Here is a very simple example of a LaTeX input file.

After loading the TeXnicCenter program create a new LaTeX document by choosing File → New in the main menu. Type the following into the Input Window, with the last line being `\end{document}`:

¹⁰The DVI format is supported natively via MiKTeX, but the PDF and Postscript options require plug-in software, see page 1 of the tutorial.

```

\documentclass[12pt]{article}
\begin{document}
Hello world!
\end{document}

```

The command at the top - `\documentclass[12pt]{article}` - tells the LaTeX software to interpret your document as an article, with text size equal to 12pt. The `\begin{document}` and `\end{document}` commands are pretty self explanatory - they tell LaTeX where to start and stop looking for contents in your article. You'll notice that the backslash key `\` is very important - it tells LaTeX that you want to use a LaTeX command.

Now save your input¹¹ as a LaTeX file: Call it `hello`. Because it is a LaTeX file the full filename will actually be **hello.tex**. After saving, Build the input into a DVI file, and then View it. You should see the simple message:

Hello World!

EXAMPLE 2: Here is an example with some mathematics and additional text and paragraph formatting. After loading the TeXnicCenter program create a new LaTeX document by choosing File → New in the main menu. Type the following into the Input Window, with the last line being `\end{document}`:

```

\documentclass[12pt]{article}
\begin{document}

```

In the market for corn, the demand curve is given by:

```

\begin{equation}
\displaystyle
q_d = \alpha_d + \beta_d p \ ,
\end{equation}

```

```

\bigskip

```

```

\noindent

```

where q_d is quantity demanded, and α_d and β_d are some constants for which $\alpha_d > 0$ and $\beta_d < 0$.

The supply curve is given by:

```

\begin{equation}
\displaystyle q_s = \alpha_s + \beta_s p \ ,
\end{equation}

```

¹¹Use the File -> Save menu to save a file, or press Ctrl + S.

`\bigskip`

`\noindent`

where q_s is quantity demanded, and α_s and β_s are some constants such that $\beta_s > 0$.

The equilibrium quantity q and price p in the corn market are then:

`\bigskip`

`\begin{center}`

`$ \displaystyle`

`q = \frac{\alpha_d \beta_s - \alpha_s \beta_d}{\beta_s - \beta_d}`

`$`

`\bigskip`

`$ \displaystyle`

`p = \frac{\alpha_s - \alpha_d}{\beta_d - \beta_s}`

`$`

`\end{center}`

`\end{document}`

In this input we have two environments in which to write math formulas - the equation environment and the “in-line” $...$ environment. We have also used text centering, similar to paragraph centering in regular word processors, and have inserted spaces via the “bigskip” command.$

Now save your input as a LaTeX file: Call it `econ`. Built and Viewed this file creates the following output:

In the market for corn, the demand curve is given by:

$$q_d = \alpha_d + \beta_d p \quad (1)$$

where q_s is quantity demanded, and α_d and β_d are some constants for which $\alpha_d > 0$ and $\beta_d < 0$. The supply curve is given by:

$$q_s = \alpha_s + \beta_s p \quad (2)$$

where q_s is quantity demanded, and α_s and β_s are some constants such that $\beta_s > 0$.

The equilibrium price p and quantity q in the corn market are then:

$$q = \frac{\alpha_d \beta_s - \alpha_s \beta_d}{\beta_s - \beta_d}$$

$$p = \frac{\alpha_s - \alpha_d}{\beta_d - \beta_s}$$

EXAMPLE 3: The document you are reading is GilbertLatex.pdf. But this document is built from a LaTeX source file - GilbertLatex.tex. Look over this source file, either in printed form (if you have it) or by opening the electronic file in TeXnicCenter. Notice all the commands at the top of the file - all but the first of these are optional commands which adjust the layout of text in the document. Also, you'll see that the material that you typed in Examples 1 and 2 looks rather different from the LaTeX source markup that generates the display of this material: That's because it takes some extra effort to get LaTeX-reserved symbols like `\` to display in the Built output of LaTeX source files.