

MiKTeX

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Contents

1	Script File mtex.bat containing the Various Commands for MikTeX	2
2	A Calculus Problem	2
3	Downloading and Installing	3
3.1	Installation of MikTeX on Toshiba Laptop, June 5, 2012	4
3.2	Setting the Path Variable, for the 2.7 version on the Netbook Running 32 bit Windows	4
4	Latex Directory	6
5	Creating a Sample LaTeX File	7
6	The Command Line	8
7	A LaTeX Tutorial	10
8	Placing Figures in LaTeX	10
9	Accents in LaTeX	11

1 Script File mtex.bat containing the Various Commands for MikTeX

```
@echo off
if "%1"==" " goto help
latex %1.tex
dvips %1.dvi
ps2pdf %1.ps
start %1.pdf
goto end
:help
echo mtex.bat, by jim emery, Version 1/16/2010,
echo runs a sequence of commands to generate a final pdf file from
echo a latex file using miktex.
echo It is probably best to run this after any latex
echo errors have been corrected. Perhaps errors are corrected best
echo by running latex from the winedt editor.
echo When there are latex errors, note the line number and type "x" to exit
echo the error prompt.
echo Usage: mtex myfile (note: the myfile name should have no tex extension)
:end
```

2 A Calculus Problem

Prove that the derivative of

$$f(x) = \frac{1}{x}$$

is

$$-\frac{1}{x^2},$$

directly from the definition of the derivative.

We have

$$\begin{aligned} \frac{df}{dx} &= \lim_{h \rightarrow 0} \left(\frac{1}{x+h} - \frac{1}{x} \right) / h \\ &= \lim_{h \rightarrow 0} \left(\frac{x - (x+h)}{(x+h)x} \right) / h \end{aligned}$$

$$\begin{aligned}
&= \lim_{h \rightarrow 0} \frac{-1}{(x+h)x} \\
&= -\frac{1}{x^2}
\end{aligned}$$

The L^AT_EXcode for this little section is:

Prove that the derivative of
 $f(x) = \frac{1}{x}$
is
 $-\frac{1}{x^2}$
from the definition of the derivative.

We have
 $\frac{df}{dx} = \lim_{h \rightarrow 0} \left(\frac{1}{x+h} - \frac{1}{x} \right) / h$
 $= \lim_{h \rightarrow 0} \left(\frac{x - (x+h)}{(x+h)x} \right) / h$
 $= \lim_{h \rightarrow 0} \frac{-1}{(x+h)x}$
 $= -\frac{1}{x^2}$

3 Downloading and Installing

The latest version of MiKTeX (March 2012) is version 2.9.

The file I am using on my XP machine and my Windows 7 32 bit machine, and which I downloaded back in 2008 is:

basic-miktex-2.7.3248.exe

I had trouble running this version on my Toshiba 64 bit machine on Windows 7. However, the latest version, which is a 32 bit version, worked fine on that machine. Download and install the latest version from

miktex.org

This file is 86,335,752 bytes, it was downloaded on 12/1/2008
from

<http://miktex.org/2.7/Setup.aspx>

3.1 Installation of MikTeX on Toshiba Laptop, June 5, 2012

I had tried to install the 2.7 package on Toshiba, but it complained about a missing file, and something about the so and so is more than 4 years old. But I downloaded the latest version 2.9, which turns out to be gigantic. The setup file for the 2.7 version, which runs fine on my Power Spec running Windows XP, and on my netbook running Windows 7, 32 bit, is:

```
12/01/2008  11:56 AM          86,335,752 basic-miktex-2.7.3248.exe
```

The downloaded 2.9 version, which is 32 bit is:

```
06/04/2012  12:28 PM        160,878,344 basic-miktex-2.9.4521.exe
```

This file is located in directory

```
c:\miktexdownload2.9
```

The 2.9 version loaded properly on the Toshiba. I ran a document called sample.tex in the directory called latex in the c: drive. The path variable was changed automatically.

3.2 Setting the Path Variable, for the 2.7 version on the Netbook Running 32 bit Windows

The setup did not set the path variable on windows 7, but I think it did on windows XP. I blundered through setting the PATH environment variable for Windows 7 by hand. The instructions below, I found on the internet. But did not seem to match my computer.

See

c:\txt\settingpath.txt

c:\je\pdf\pathvariable.pdf

Setting the Path on Windows 7 32 bit:

- (1) Select Computer from the Start menu
- (2) Choose System Properties from the context menu
- (3) Click Advanced system settings, Advanced tab
- (4) Click on Environment Variables, under System Variables, find PATH, and click on it.
- (5) In the Edit windows, modify PATH by adding the location of the class to the value for PATH. If you do not have the item PATH, you may select to add a new variable and add PATH as the name and the location of the class as the value.

On Windows XP:

Start -> Control Panel -> System -> Advanced
Click on Environment Variables, under System Variables,
find PATH, and click on it.

In the Edit windows, modify PATH by adding the location of the class to the value for PATH. If you do not have the item PATH, you may select to add a new variable and add PATH as the name and the location of the class as the value.

Close the window.

Reopen Command prompt window, and run your java code.

4 Latex Directory

I put the file in a directory called

```
c:\latex
```

I create the tex source files in this directory and run the MikTeX programs from there. But this can be done from any directory. When I ran basicmiktex-2.7.3248.exe by typing its name, everything was installed and the programs were ready to go.

MiKTeX is a program to be run from the command line. The path variable was altered by the installation to add the binary directory of MiKTeX to the path. This means that the operating system will find the programs from any directory. We will run LaTeX on a source file that is created in a text editor such as notepad.

There is a more gui-like free TeX version for MacOSX called MacTeX, which I downloaded and installed. It produces a pdf file directly. There are probably gui-like Windows versions like this also, that are available. There is a national organization that deals with TeX and LaTeX and distributes versions. It is called CTAN. They also publish a magazine called Tugboat. I used to subscribe years ago. They have a new distribution called Live TeX , I think. There are live versions of TeX that run directly from a CD or DVD without being installed on the harddrive.

A LaTeX system comes with most Linux distributions. Latex source is a simple txt file, and as such will always be available and editable. One can

not say this about your masterpiece written in Wordstar, WordPerfect, or even Microsoft Word.

5 Creating a Sample LaTeX File

The source for a TeX or LaTeX file is a text file containing content and markup commands. It should have *tex* as the file extension. Notepad may try to put a ".txt" at the end of the saved file name. Beware of this. There are better editors. Assuming we have created a file called `sample.tex`, we process it with LaTeX with the following command:

```
latex sample.tex
```

If there are errors in the source file, LaTeX will stop at the error and wait for you to correct the error. This is a feature that Don Knuth put into the original TeX to save time in correcting errors because computers were very slow maybe. But it can be maddening. I never do any correcting, but rather type an "x" to escape from LaTeX, while making note of the line number of the error. It is best to use an editor that gives line numbers. I correct the error or errors in the editor, save and then call LaTeX again. This can be done quickly. One should run LaTeX frequently as the material is being written, so that any error that appears, will be in the latest content just written, and so easily found.

Now assuming that the LaTeX program runs to completion, three or four files will be created. One of these is the typeset output file, which in this case will be called `sample.dvi`. This is a device independent file. From this file one creates a printable file. Usually one creates a postscript file, which in the old days could only be printed on a Postscript printer such as the Apple Laser Writer. There is a program called "dvips" that converts the dvi file to a postscript file. The dvips program for MiKTeX runs as follows.

```
dvips sample.dvi
```

It produces a postscript file called "sample.ps." In the old days one would send this file to a postscript printer. One can use the free public program Ghostscript, or a windows gui version Ghostview to view and then print the file to any printer. Even better, one can convert the program to an Acrobat pdf file. There is such a converter that comes with MiKTeX.

```
ps2pdf sample.ps
```

This creates a pdf file called "sample.pdf," which may be viewed and printed with Acrobat reader. To open the pdf file in Windows from the command line, do this

```
start sample.pdf
```

As an aside, on the Macintosh OSX system, an equivalent action from the command line would be

```
open sample.pdf
```

If you happen to have Acrobat Distiller on your windows system, conversion to pdf can be done on the command line like thus:

```
start sample.ps
```

If you are using Notepad as your editor, you should open it outside of the directory you are working in so that it will remain open as you modify your tex source and typeset it from the command line. When you find an error at a given line, you can goto that line in Notepad by selecting the goto item from the notepad edit menu. Notepad is, of course, not the greatest editor, although cutting and pasting works well.

6 The Command Line

There may be readers who did not grow up with Unix and DOS and don't know how to use the command line. In earlier versions of Windows there was always an MSDOS icon on the desktop, or in the start menu. However, under Windows NT, Windows 2000, and Windows XP, you might have to create a shortcut to the command line program located at

```
%SystemRoot%\system32\cmd.exe
```


Alternately click the "Start" button, then the "Run" button then type in "cmd.exe" in the box. However, this loads the command line a little strangely on some systems, does not support the up-arrowkey as repeat the last command, and give trouble in closing the command line window. I think because it is running outside of windows as a dos program.

On a Macintosh OSX system, one gets to the command line by going to the Utilities directory and clicking on Terminal.

Recall some commands:

```
c: (Go to the c drive on a Windows machine.)
cd \ (Go to the root directory on a Windows machine.)
mkdir latex (Create a directory called latex. )
cd latex (Go to the latex directory.)
type joe.txt (Display a file called joe.tex on a Windows machine.)
cat joe.txt (Display a file called joe.tex on a Unix, Linux, or MacOSX machine)
cd ~/ (Go to your home directory on a Unix, Linux, or MacOSX machine)
dir (Display the files in a directory on a Windows machine)
ls -la (Display the files in a directory on a Unix, Linux, or MacOSX machine)
notepad (Open the notepad editor on a Windows machine)
open -a TextEdit (Open the TextEdit editor on a MacOSX machine.)
```

Note: On a windows machine directories are specified with a back slash "; but on a Unix, Linux, or MacOSX machine, directories are specified with a forward slash "/".

Note: The Mac program TextEdit has a word processing mode and a text mode. Be sure to select "text" under "Format" if you want to create a text or tex file.

Note: There are better editors for writing programs and TeX documents then Notepad and TextEdit, on both Windows and Unix/Linux/MacOSX. Winedit is a nice editor for Windows, and has line numbers and so on. I was a shareware program and I don't know if it is still available. There are the standard Unix editors: Vi, Emacs, Pico, Nano, joe and so on. Vi and Emacs, are very powerfull, but rather old fashioned and difficult for the novice.

7 A LaTeX Tutorial

LaTeX is a TeX macro that creates simplified commands. It was created by Leslie Lamport. There are many books describing the use of TeX and LaTeX, including a couple by Lamport, and a technical discription of TeX by the creator of TeX, Don Knuth. There are probably hundreds of books on LaTeX and TeX. TeX is used by many, if not most of the mathematical and Scientific Journals, and probably a majority of scientific books are written in a version of TeX. Each journal has a certain preferred style, and thus has a required style file. Here is a very nice short tutorial on using LaTeX:

<http://www.stem2.org/je/GSWLaTeX.pdf>

8 Placing Figures in LaTeX

There are many systems and macros for placing figures in a TeX and a Latex document. I system I have used for a long time is called **psfig**. This system uses a style file called

`psfig.sty`

This is a macro written in TeX and allows postscript figures to be included in a document as figures. This file does not seem to come with MiKTeX, but can be found on the internet. It is recommended to be placed in a subdirectory of the LaTeX directory called macros. However, I did not see such a subdirectory in MiKTeX, so I placed a copy in the directory from which I am running LaTeX, and this works. To see how to use psfig, refer to my document called **figures.tex**, or **figures.pdf**, or look at one of my tex files that uses psfig. A Postscript file that is to be included needs to have a bounding box statement. There are many other systems for including graphics figures in a LaTeX document. Bitmap graphics can be included.

9 Accents in LaTeX

`\'` acute accent

`\.` dot accent

`\=` macron accent

`\^` circumflex accent

`\‘` grave accent

`\"` umlaut accent

`\~` tilde accent

`\c` cedilla accent

`\d` underdot accent

`\H` Hungarian umlaut accent

`\t` tie-after accent

`\u` breve accent

`\v` check accent