



Journal of Statistical Software

October 2006, Volume 17, Software Review 1.

<http://www.jstatsoft.org/>

Reviewer: Andreas Karlsson
Uppsala University

Scientific WorkPlace 5.5

MacKichan Software, Inc., Poulsbo, Washington. USD 845 (standard), USD 735 (academic), USD 260 (student).

<http://www.mackichan.com/>

LyX 1.4.2

The LyX Project, Oslo, Norway. Open source.

<http://www.lyx.org/>

Introduction

Many statistics journals require that admitted articles should be written using \LaTeX . However, for a beginner, \LaTeX could be quite hard to use. To make it easier to handle \LaTeX , a plethora of editors, both commercial and free, are available for \LaTeX . This review will look at two of the most advanced of these editors, **Scientific WorkPlace** (SWP) and **LyX**. Some would call these WYSIWYG (what you see is what you get) editors for \LaTeX , but this is not entirely correct, since the produced output is not exactly what is seen on the screen. Instead, basically, these are front-ends for \LaTeX with graphical user interfaces (GUIs), which insert \LaTeX code as symbolical objects in the editor, instead of as plain text. The **LyX** manual calls this WYSIWYM (what you see is what you mean). It is best understood by using an example.

Assume that one would like to write the formula for the cumulative distribution function of the normal distribution,

$$\Phi(x|\mu, \sigma) = \int_{-\infty}^x \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2} dx.$$

Using \LaTeX , one has to write

```
 $\Phi\left(x|\mu, \sigma\right)=\int\limits_{-\infty}^x\frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}dx$ 
```

to produce this formula, and even then, the formula is not seen on the screen until it has

Features	SWP	SW	SNB	SV
Viewing and printing documents	•	•	•	•
Mathematical word processing	•	•	•	
Typesetting with L \AA T \E X	•	•		
Built-in computer algebra system	•		•	
Price (fixed license)	\$845/735/260*	\$630/525/180	\$222/148/99	Free

* Commercial/Academic or governmental/Student

Table 1: Features and prices of the different softwares from MacKichan Software, Inc.

been compiled to a document with T \E X. With SWP or L γ X, this formula is produced by first clicking on the icon for Φ , then clicking on the icon for $()$, entering x and $|$, clicking on the icon for μ , and so on. And the formula appears on the screen exactly as it should, even without having to compile it to a document using T \E X, as is shown in Figure 1. The automatic formatting is good in both programs, with for example the bracket size in the above formula chosen automatically.

Scientific WorkPlace and L γ X

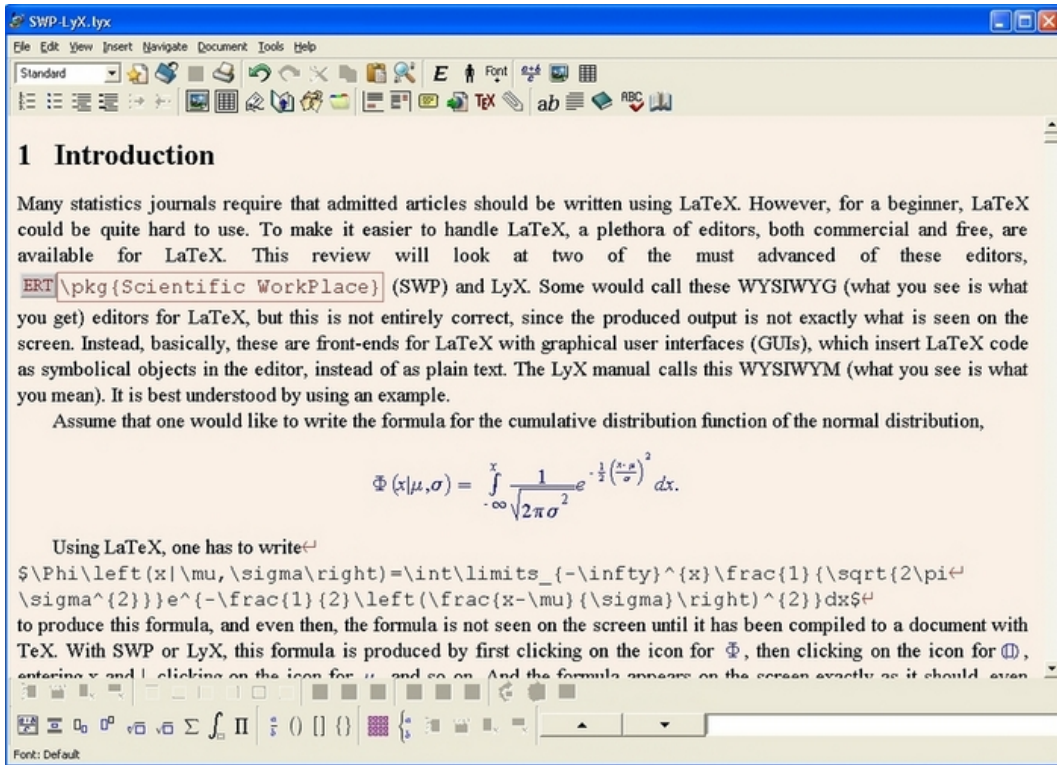
Scientific WorkPlace is a commercial software, which besides being a front-end for L \AA T \E X also has a built-in computer algebra system (CAS). It is developed and published by MacKichan Software, Inc.,¹ a company founded in 1981 under the name Triad Computing, Inc. In 1992, having changed its name to TCI Software Research, Inc., it released the predecessor of SWP, called **Scientific Word** (SW), which basically was SWP without the built-in computer algebra system.

The first version of SWP was released in 1994. In 1996 the company also released **Scientific Notebook** (SNB), which essentially was SWP without the L \AA T \E X typesetting capability. TCI Software Research, having been purchased by Brooks Cole Publishing Co. in 1993, was repurchased in 1998 by Barry and Lynda MacKichan, the cofounders of Triad Computing, and renamed MacKichan Software, Inc. Besides publishing SWP, SW, and SNB, it has also released **Scientific Viewer** (SV), which can view and print but not edit documents produced with SWP, SW, and SNB. This is available free of charge. The features of the four different products can thus be summarized as in Table 1.

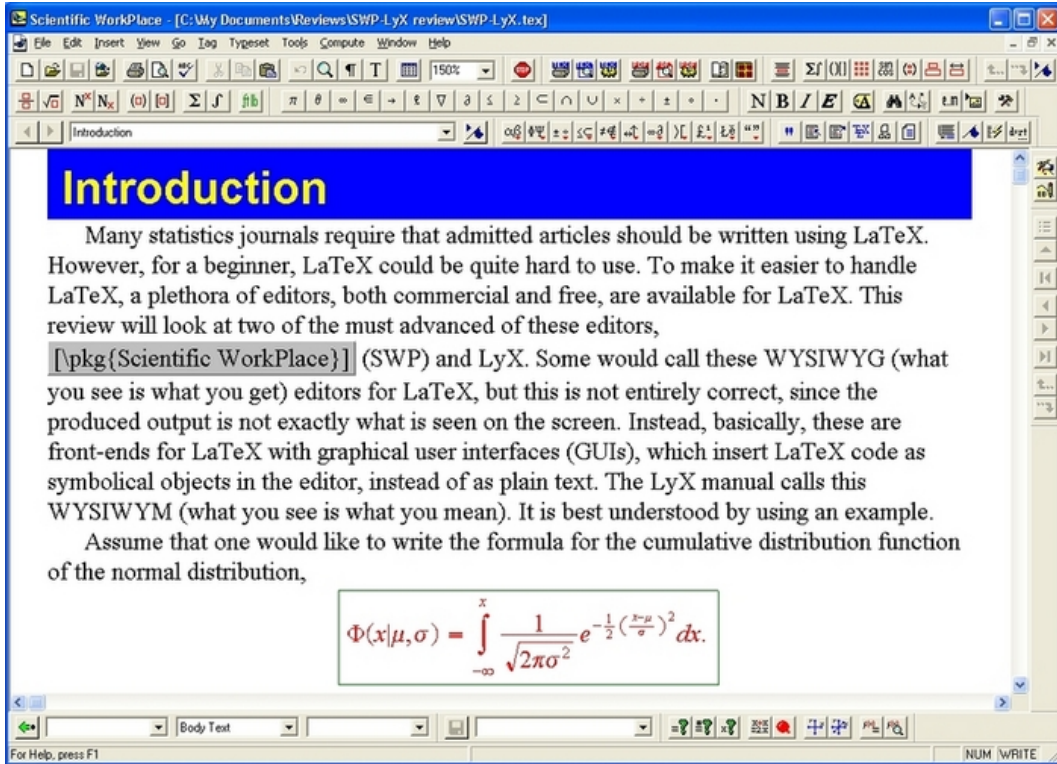
The latest version of SWP, SW, SNB, and SV is 5.5, which was released on July 28, 2005. It is only available for Windows. The licenses bought can be fixed or floating, as well as six-month or one-year licenses. The prices are also different depending on if the usage is commercial, academic/governmental or student. Besides English, SWP and SW are also available in German and Japanese. SWP 5.5 has been reviewed by [Hardin and Hilbe \(2006\)](#), while SWP 4.0 was reviewed by [McCabe \(2002\)](#) and SWP 3.0 by [Murphy \(1999\)](#).

L γ X is a open source software published under the GNU General Public License (<http://www.gnu.org/licenses/gpl.html>). It was originally developed by Matthias Ettrich, with the first version appearing around 1995 (<http://www.mail-archive.com/lyx-users@lists.lyx.org/msg50791.html>). Ettrich later handed over the project to Lars Gullik Bjønnes. He

¹The history of MacKichan outlined in this section is based on the company's Corporate History, available from <http://www.mackichan.com/corporate.html>



(a) LyX



(b) Scientific WorkPlace

Figure 1: Screenshots of LyX and Scientific WorkPlace showing all available toolbars

continues to head the project today, together with a team of voluntary developers, coordinating the project through the LyX Developers' mailing list (<http://www.mail-archive.com/lyx-devel@lists.lyx.org/>). LyX was originally called **LyriX**, but the name was later shortened to LyX, since the name **Lyrix** was already used by a commercial word processor (<http://www.mail-archive.com/lyx-devel@lists.lyx.org/msg16682.html>). Version 1.0 of LyX was released in 1999. Originally, it was only available for UNIX/Linux, but the latest versions also support Windows and Mac OS.² The current version is LyX 1.4.2,³ which was released on July 12, 2006. This review is based on the Windows version of LyX 1.4.2. Besides English LyX is also available in 17 other languages.

Manuals and help

SWP 5.5 includes four printed manuals: *Getting Started with Scientific WorkPlace, Scientific Word, & Scientific Notebook Version 5* (Bagby 2005b), 86 pp., *Creating Documents with Scientific WorkPlace & Scientific Word Version 5* (Bagby 2005a), 406 pp., *Typesetting Documents in Scientific WorkPlace & Scientific Word* (Bagby and Pearson 2005), 222 pp., and *Doing Mathematics with Scientific WorkPlace & Scientific Notebook Version 5.5* (Hardy and Walker 2005), 504 pp.

The manuals are detailed and well-written, with easy-to-follow step-by-step instructions for performing the different tasks of SWP, SW, and SNB. *Getting Started...* gives an introduction to the programs, with instructions for performing the basic operations for mathematical word processing, computing and plotting using the CAS, and typesetting with L^AT_EX. *Creating Documents...* gives more detailed instructions on the entering and editing of texts and mathematics, using graphics and tables, as well as creating, structuring and formatting documents. *Typesetting Documents...* is devoted to typesetting documents in SWP and SW using L^AT_EX. It gives instructions on customizing the typesetting and detailed descriptions of the L^AT_EX packages that are included with SWP and SW, and how they should be used. *Doing Mathematics...*, finally, gives details about using the built-in CAS for SWP and SNB. This is a very useful manual, with separate chapters covering such standard topics in the undergraduate mathematics curriculum as calculus, linear algebra, vector analysis, differential equations, and statistics. The topics are discussed by giving some theory and showing how examples of data are evaluated using SWP/SNB. The chapters even include exercises and solutions for users who are interested in practicing the ideas presented.

The help files in the software include contents, index, and search functions. However, I have not found these being especially useful, often being hard to follow and understand. The manuals are considerably better. A problem with this is that when a multi-user license is used, only one set of printed manuals is available for many users, making the manuals less accessible. For this reason, it would have been useful to have the manuals included as searchable PDF-files and available from the help menu.

LyX has no printed manuals, but five different manuals are available from the help menu: *Introduction to LyX* (LyX Team 2006c), 17 pp., *The LyX Tutorial* (LyX Team 2006d), 32 pp., *The LyX User's Guide* (LyX Team 2006e), 97 pp., *Extended LyX Features* (LyX Team 2006b), 117 pp., and *Customizing LyX: Features for the Advanced User* (LyX Team 2006a), 81 pp.

²For the history and development of LyX, see <http://www.lyx.org/news.php>

³A later version, LyX 1.4.3, has been released after this review was written.

The manuals are available as documents written in LyX for on-screen reading, but can also be compiled to PDF-files and printed, for those who prefer this.

Introduction... gives an overview of the philosophy of LyX and instructions on navigation of the documentation. The *Tutorial* gives information on how to get started with LyX, and the basics of writing documents and using mathematical word processing. The *User's Guide* is the primary manual for LyX, containing detailed instructions for using the available features of LyX. *Extended...* is an extension of the *User's Guide*, covering the more advanced features of LyX, such as special-purpose editing features, inserting L^AT_EX code in LyX and using some special L^AT_EX document classes. *Customizing...*, finally, describes how the user can customize the overall behavior of LyX, including the installation of new L^AT_EX document classes.

Although the LyX manuals do not have the easy-to-follow step-by-step instructions of SWP, they are still easy to understand, and one usually find answers for ones questions. However, one feature which I am missing in these manuals is that they contain no screenshots from the software, which makes it harder to understand the manuals and relate these to the software. But the main shortcoming is that the manuals are not up-to-date. It seems like the manuals are written for an earlier version of LyX, and that all the changes for the current version have not been documented. Thus, for example, sometimes the manuals mention some menu entry that cannot be find where it is supposed to be, but instead is found under another menu. Also, some features are not documented at all, as for example how to use Computer Algebra Systems like GNU Octave ([GNU Octave Project 2006](http://www.gnu.org/software/octave/)) or **Maxima** ([Maxima Project 2006](http://www.maxima-project.org/)) within LyX, although there are menu entries for this. However, since LyX is an open source software written on an voluntary basis, on the developers spare time, one have to take it as is, and not expect too much. The developers also invite the users to contribute to the project by updating the manuals. The documentation of LyX is coordinated on a mailing list (<http://www.mail-archive.com/lyx-docs@lists.lyx.org/>).

Regarding support for LyX, one could of course not demand to get any from the developers, since this is not a commercial software. However, there is a very active LyX Users' mailing list (<http://www.mail-archive.com/lyx-users@lists.lyx.org/>), where one usually gets fast and accurate support from other LyX users.

Installation

SWP is easy to install, just insert the program CD obtained from the company into the CD-ROM drive, and the CD starts itself automatically. Besides installing SWP, some extra software are also installed, such as the B^IB^TE_X public domain bibliography manager BIBDB ([Doron 1999](http://www.bibdb.org/)) and a Style Editor for creating and modifying typesetting specifications for documents produced with SWP and SW.

To install LyX there are several alternatives. From the LyX FTP site (<ftp://ftp.lyx.org/>) one can download precompiled installation files (<ftp://ftp.lyx.org/pub/lyx/bin/>) for Windows, Mac OS or Linux, or one can download the source files (<ftp://ftp.lyx.org/pub/lyx/stable/>) and compile LyX oneself. The Windows user also has the possibility to download an unofficial installer called LyXWinInstaller (<http://developer.berlios.de/projects/lyxwininstall>). For this review the official installer for LyX 1.4.2 under Windows XP is used.

LyX is dependent on some third party software to handle specific tasks, such as spell checking

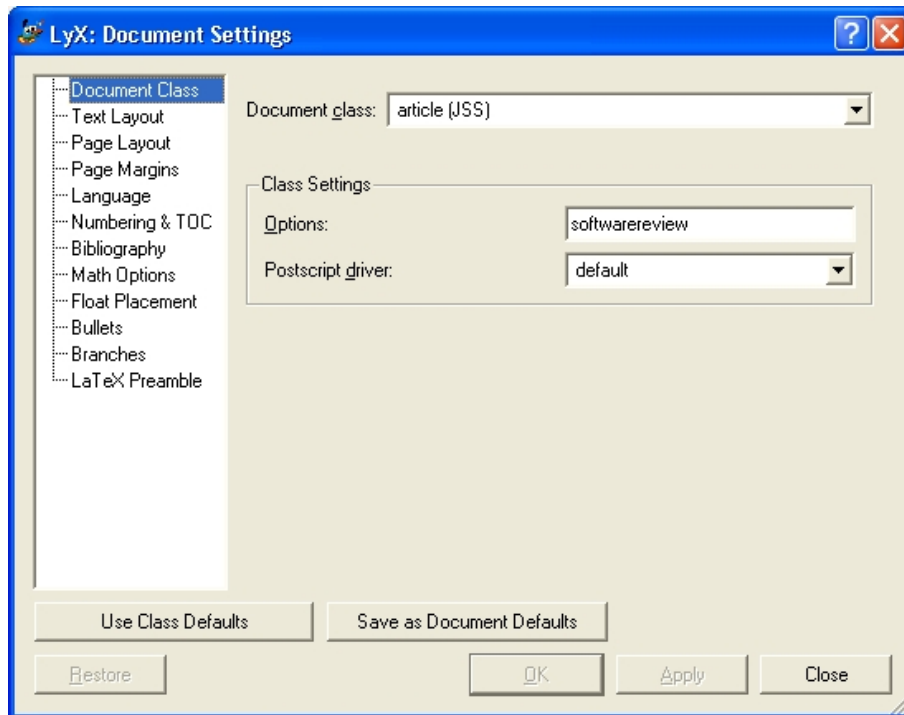


Figure 2: JSS \LaTeX class with the option “softwarereview” installed on LyX

and converting images, but first and foremost it needs a \LaTeX -distribution. The user has the possibility to download LyX as a single executable file without the third party programs, which can be useful if these are already installed, for example from an earlier installation of LyX. However, the LyX installer can also be downloaded as a single executable file including all necessary third party programs. The latter alternative was used to install LyX for this review.

Installing LyX is easy. The installation program automatically checks if the necessary third party programs are already installed, and else automatically installs these. The \LaTeX -distribution included is MiK \TeX (MiK \TeX Project 2003), although the user can choose to not install this and instead use another \LaTeX -distribution if it is available.

Word processing

To start writing an article in SWP or LyX one first has to choose a \LaTeX based document style or class. SWP calls these shells. Both SWP and LyX have many preinstalled document classes for different purposes, such as articles, books, letters, reports, and slides. However, when writing an article for a journal one often finds that it requires that one uses a particular \LaTeX class which the journal has developed. Since this is usually not included with SWP or LyX, one has to install it and make SWP or LyX recognize it oneself. I find it to be very easy in LyX but quite hard in SWP.

Writing an article in SWP or LyX is not more difficult than to write it in an ordinary word processor such as Microsoft **Word**. Although one can print a document in SWP or LyX without using \LaTeX , the main difference from an ordinary word processor is found when printing the

document after compiling it using \LaTeX . The appearance of the printed document depends on the \LaTeX class used, and is thus not exactly WYSIWYG.

I found SWP to be somewhat harder than LyX to learn for a beginner. It is also easier for the user to customize a document in LyX than in SWP. For example, changing the page margins in LyX is easily done via menu entries, but in SWP one has to insert \LaTeX code in a special Preamble box to obtain the same result.

Both SWP and LyX have most of the features of ordinary word processors, with some differences between the two programs on how these are implemented. One feature that I really miss in SWP is a good undo/redo function. The undo function in SWP can only undo the latest deletion, and it has no redo function. In contrast to this, LyX has a very good undo/redo function, where any number of undos can be done for not only deletions but also for insertions, and they can also be redone with a redo function. LyX also has useful functions for word counting and change tracking that SWP lacks. Another nice function of LyX missing in SWP is that you cannot write two spaces after each other by hitting `<Space>` or insert extra lines by hitting `<Enter>`, thus preventing the user from accidentally inserting extra spaces or lines. If the user wants to insert extra spaces or lines he or she can instead do this by choosing from different kinds of horizontal and vertical spaces from a menu. The latter choice is available also for SWP.

Both SWP and LyX have built-in spell checking functions. LyX uses the open source GNU **Aspell** ([GNU Aspell Project 2005](#)) spell checker. Both work well. American English is the only language included in SWP, but one can buy dictionaries for other languages. LyX includes support for 53 languages or language versions. A grammar checker is not included in neither, but LyX has a built-in thesaurus function, which is missing in SWP.

Many \LaTeX functions and commands are available via menus and toolbar buttons in both SWP and LyX . But it is impossible to have menu entries for all \LaTeX functions and commands. However, both SWP and LyX have the possibility to go native with \LaTeX and use plain \LaTeX code. This code is inserted in special \TeX code boxes.

Both LyX and SWP use their own file formats. The SWP file format is a variant of \LaTeX , but inserts special commands that are not understood by other \LaTeX editors, and can thus not be read as is by other \LaTeX editors. However, both LyX and SWP include the possibility to export to and import from standard \LaTeX file format. SWP also has functions for exporting to HTML and RTF file formats that work well, and for importing RTF file format. This is a weak side for LyX . Although it claims to be able to export to HTML and **OpenOffice.org** Writer file formats, I have not been able to do this. The possibility to import and export RTF documents is a feature that I really miss in LyX .

Mathematics

Both SWP and LyX have two modes for writing: text mode and math mode. One of the features that distinguishes SWP and LyX from ordinary \LaTeX editors is the way they handle mathematical formulas. Instead of writing plain \LaTeX code to insert mathematical symbols, these can be inserted by only using menus and toolbar buttons. The user thus does not have to know anything about \LaTeX programming or \LaTeX code, and the symbols and formulas that are inserted are immediately seen on the screen as symbolical objects instead of as \LaTeX code.

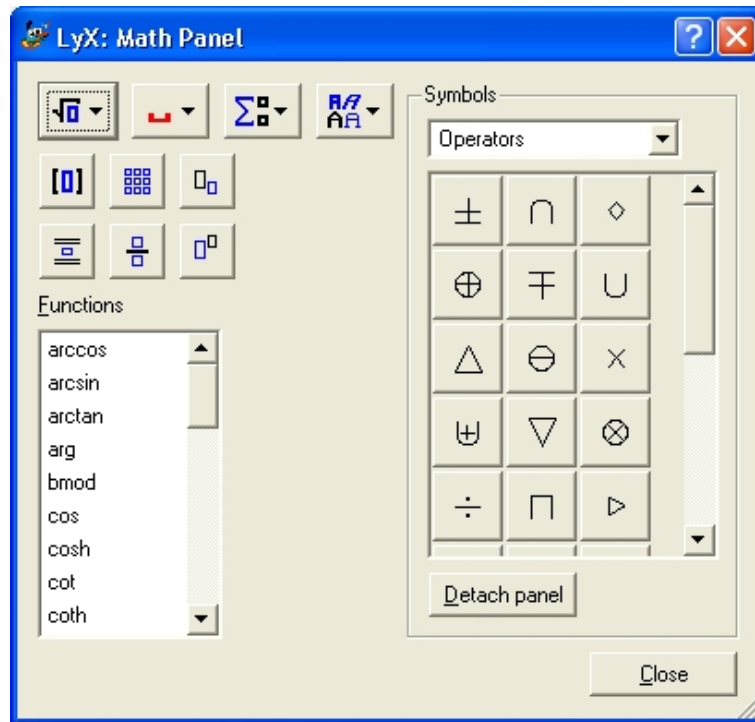


Figure 3: The Math Panel in LyX

SWP has highly adjustable toolbars, so that most mathematical symbols are accessible with only one or two clicks on toolbar buttons. Writing and editing mathematical formulas using SWP is fast and efficient. Compared to this, LyX has a somewhat less efficient system, with only a few toolbar buttons for accessing mathematical symbols. Most mathematical symbols are instead available from a Math Panel (see Figure 3), which means that inserting a mathematical symbol often requires more clicks on menu entries, buttons and drop-down lists in LyX than in SWP, making the writing and editing of mathematical formulas in LyX somewhat slower and less efficient. Navigating in the formulas is also easier in SWP, and the appearance on screen is better. Further, one feature found in SWP that I miss in LyX is automatic numbering of new equations.

As far as I have checked, all mathematical L^AT_EX symbols are available via menus or toolbar buttons in both SWP and LyX. However, using menus and toolbar buttons is not the only way to write mathematical formulas in SWP and LyX. The user also has the possibility to use plain L^AT_EX code. The support for this is much better implemented in LyX than it is in SWP. Suppose that one wants to insert the integral sign \int with L^AT_EX code. To do this in SWP one has to open a box for inserting L^AT_EX code, type the L^AT_EX code `\int` in it, and close the box. However, the integral sign is never seen on the screen, but first in the compiled document. In LyX one has two possibilities. The first is to switch to math mode and just write `\int` followed by `<Space>`. The integral sign \int then immediately appears on the screen, replacing the L^AT_EX code. The other possibility is to proceed as with SWP, i.e., opening a box for inserting L^AT_EX code, type the L^AT_EX code `\int`, and compile the document to see the symbol.

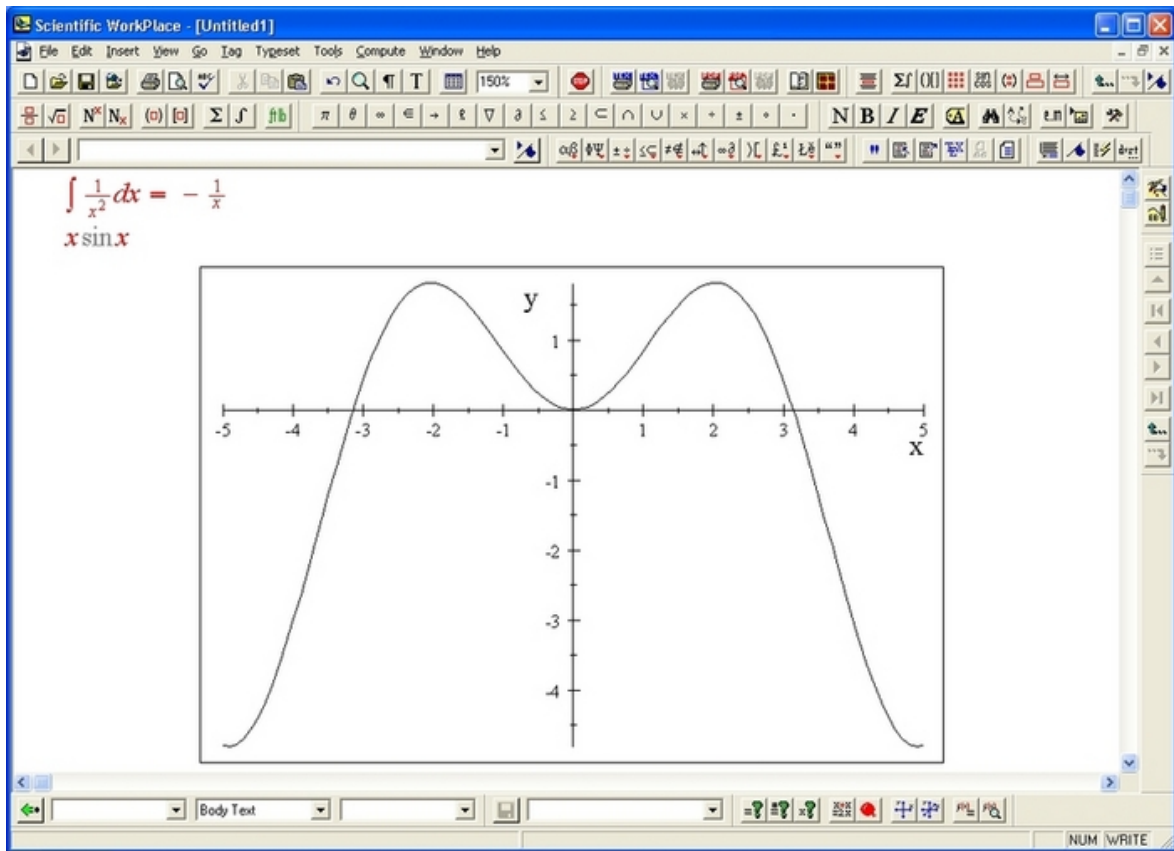


Figure 4: Computer algebra calculation and plotting in SWP

Computer algebra

One nice feature of SWP is that it is integrated with the **MuPAD** (SciFace Software 2004) computer algebra system, which means that mathematical functions can be evaluated and the solutions included directly in the document, without having to change to an external program. For example, by writing

$$\int \frac{1}{x^2} dx =$$

and clicking on the toolbar button Evaluate or choosing Compute ▸ Evaluate from the menu, the solution immediately appears in the document as

$$\int \frac{1}{x^2} dx = -\frac{1}{x}.$$

It is equally easy to plot curves of functions. By writing for example $x \sin x$ and clicking on the toolbar button Plot 2D Rectangular or choosing Compute ▸ Plot 2D ▸ Rectangular from the menu, a plot of this function is immediately constructed and inserted in the document.

LyX has a menu entry for using computer algebra systems by calling external programs, where one can choose to use GNU Octave (GNU Octave Project 2006), Maxima (Maxima Project 2006), Mathematica (Wolfram Research, Inc. 2005) or Maple (Maplesoft 2005). However, this

function does not seem to work for the current version. At least I have not got it to work. Further, there are no references to this in any of the manuals.

Concluding remarks

SWP and LyX are both user-friendly front-ends for L^AT_EX with many useful functions, although I found LyX to be easier to use for a beginner. It is also easier to customize a document in LyX, while the user interface is more customizable in SWP. Otherwise, regarding the word processing and mathematical capability they are comparable. The main advantage of SWP is the inclusion of a computer algebra system which is directly accessible from inside the program.

The main feature missing in LyX is the possibility to import from and export to Microsoft **Word** and other word processors. **Word** is the de facto standard software in many scientific disciplines, and one often finds that one has to exchange documents with **Word** users. Including a function to import and export documents in the RTF format, which most word processors can read and write, would be a great improvement in LyX. As is noted, SWP already has this feature. Another point on my wish list for LyX is to make the toolbars more customizable and the access to math symbols and other functions easier, with more toolbar buttons. Further, the manuals need to be updated and improved.

For SWP, I would like to see a more user-friendly way to customize documents, without having to use as much L^AT_EX code as now. Further, it should be easier to include and use external L^AT_EX classes and styles. Some other features missing are change tracking, word counting and the possibility to also insert mathematical symbols via L^AT_EX code in math mode. Having SWP available in more languages would also be useful. Finally, considering that LyX is free and comparable to SWP in almost all functions except the computer algebra part, the price of SWP is hardly justifiable. Dictionaries for other languages than American English should also be included free of charge.

References

- Bagby S (2005a). *Creating Documents with Scientific WorkPlace & Scientific Word Version 5*. MacKichan Software, Inc., Poulsbo, OK.
- Bagby S (2005b). *Getting Started with Scientific WorkPlace, Scientific Word, & Scientific Notebook Version 5*. MacKichan Software, Inc., Poulsbo, OK.
- Bagby S, Pearson G (2005). *Typesetting Documents in Scientific WorkPlace & Scientific Word*. MacKichan Software, Inc., Poulsbo, OK, 3rd edition.
- Doron E (1999). *BIBDB Version 2.2*. Caesarea. URL <http://www.ctan.org/tex-archive/support/bibdb/>.
- GNU Aspell Project (2005). *GNU Aspell Version 0.60.4*. Boston, MA. URL <http://aspell.sourceforge.net/>.
- GNU Octave Project (2006). *GNU Octave Version 2.9.9*. Madison, WI. URL <http://www.gnu.org/software/octave/>.

- Hardin JW, Hilbe JM (2006). “A Review of **Scientific WorkPlace** 5.5.” *The American Statistician*, **60**(1), 93–96.
- Hardy DW, Walker CL (2005). *Doing Mathematics with **Scientific WorkPlace** & **Scientific Notebook** Version 5.5*. MacKichan Software, Inc., Poulsbo, OK.
- Maplesoft (2005). **Maple** Version 10. Waterloo, Ontario. URL <http://www.maplesoft.com/>.
- Maxima Project (2006). **Maxima** Version 5.10.0. Batavia, IL. URL <http://maxima.sourceforge.net/>.
- McCabe M (2002). “Review of **Scientific WorkPlace** v4.0 – A Mathematical Tool Reaches Maturity.” *MSOR Connections*, **2**(4), 32–36. URL <http://mathstore.ac.uk/newsletter/nov2002/pdf/swp2.pdf>.
- MiKTeX Project (2003). *MiKTeX* Version 2.4. Berlin. URL <http://www.miktex.org/>.
- Murphy B (1999). “**Scientific WorkPlace** and **Scientific Notebook** Version 3.” *CHEER – Computers in Higher Education Economics Review*, **13**(2), 30–35. URL http://www.economicsnetwork.ac.uk/cheer/ch13_2/ch13_2p30.pdf.
- SciFace Software (2004). **MuPAD** Version 3.1. Paderborn. URL <http://www.sciface.com/>.
- LyX Team (2006a). *Customizing LyX: Features for the Advanced User*. The LyX Project, Oslo.
- LyX Team (2006b). *Extended LyX Features*. The LyX Project, Oslo.
- LyX Team (2006c). *Introduction to LyX*. The LyX Project, Oslo.
- LyX Team (2006d). *The LyX Tutorial*. The LyX Project, Oslo.
- LyX Team (2006e). *The LyX User’s Guide*. The LyX Project, Oslo.
- Wolfram Research, Inc (2005). **Mathematica** Version 5.2. Champaign, IL. URL <http://www.wolfram.com/>.

Reviewer:

Andreas Karlsson
Divison of Statistics
Department of Information Science
Kyrkogårdsgatan 10, P.O. Box 513
S-75120 Uppsala, Sweden
E-mail: andreas.karlsson@dis.uu.se
URL: <http://www.dis.uu.se/>

Journal of Statistical Software
published by the American Statistical Association

<http://www.jstatsoft.org/>
<http://www.amstat.org/>

Volume 17, Software Review 1
October 2006

Published: 2006-10-27
