

# Tools of the Trade:

## The Math Graduate (and Undergraduate) Student's Toolbox

A. J. Meir

Department of Mathematics and Statistics  
Auburn University

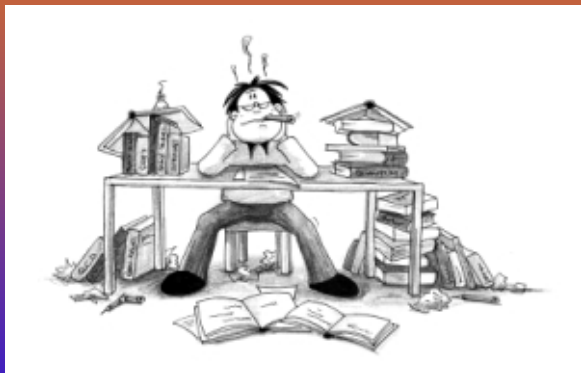
# The Mathematician's Tools

So You Want to be a Mathematician

- ▶ What do you really need to know (what tools do you need)?



# Literature Search



# Math Databases

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- MR2542680 (2010j:05076)** Rodger, C. A.; Roy, Meredith Combinatorial group testing in bipartite graphs. *J. Combin. Math. Combin. Comput.* 70 (2009), 247–252. (Reviewer: Xiao Dong Hu), 05B30  
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- MR2533152 (2010i:05197)** Ozkan, Sibel; Rodger, C. A. Hamilton decompositions of graphs with primitive complements. *Discrete Math.* 309 (2009), no. 14, 4883–4888. (Reviewer: Matthew Johnson), 05C45 (05C70)  
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- MR2533125** Andersen, Lars Døvling; Rodger, Chris Preface [Special issue: Graphs and designs in honour of Anthony Hilton]. *Discrete Math.* 309 (2009), no. 14, 4661–4662, 01A70 (05-06)  
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- MR2486895 (2010d:05014)** Huang, Wen-Chung; Rodger, C. A. A decomposition of  $(\lambda K_n)^+$  with extended triangles. *Math. Slovaca* 59 (2009), no. 2, 155–176. (Reviewer: Magdi H. Armanious), 05B07 (05C70)  
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- MR2489422 (2010a:05106)** Dinavahi, Chandra; Rodger, C. A. Diagonally switchable 4-cycle systems revisited. *Australas. J. Combin.* 43 (2009), 231–236, 05C38 (05C70)  
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### Top 50 Co-authors (by number of collaborations)

Andersen, Lars Døvling	Ashe, D. J.	Bennett, Frank E.	Billington, Elizabeth J.	Broersma, Hajo J.
Bryant, Darryn E.	Colbourn, Charles J.	Daven, Mike	Dejter, Italo José	Dinavahi, Chandra
Zanati, Saad I.	Foust, G. M.	Fu, Chin Mei	<b>Fu, Hung-Lin</b>	Grant, Carrie
Hamm, Rose C.	Hilton, Anthony J. W.	Hoffman, Dean G.	Huang, Wen-Chung	Jarrell, Sasha Logan
Johnson, Matthew	Johnson, Peter D., Jr.	Küçükcıoğlu, Selda	Leach, C. D.	Leonard, Douglas A.
Lin, Yuqing	<b>Lindner, Charles Curtis</b>	Logan, S. L.	McCauley, L.	McGee, J. W.
Meszka, Mariusz	Miller, Mirka	Newman, Nick	Ozkan, Sibel	Phelps, Kevin T.
Quattrocchi, Gaetano	Raines, Michael E.	Roy, Meredith	Salman, A. N. M.	Sarvate, Dinesh G.
Seberry, Jennifer R.	Smith, Todd B.	Spicer, Erin R.	Stinson, Douglas R.	Stubbs, Sidney
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**Embedding Steiner triple systems in hexagon triple systems.** (English summary)  
*Discrete Math.* 309 (2009), no. 2, 487–490.  
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Summary: "A hexagon triple is a graph consisting of the three triangles (triples)  $\{a, b, c\}$ ,  $\{c, d, e\}$ , and  $\{e, f, a\}$ , where  $a, b, c, d, e$ , and  $f$  are distinct. The triple  $\{a, c, e\}$  is called an inside triple. A hexagon triple system of order  $n$  is a pair  $(X, H)$  where  $H$  is a collection of edge disjoint hexagon triples which partitions the edge set of  $K_n$  with vertex set  $X$ . The inside triples form a partial Steiner triple system. We show that any Steiner triple system of order  $n$  can be embedded in the inside triples of a hexagon triple system of order approximately  $3n$ ."

**References**

- C.J. Colbourn, A.C.H. Ling, G. Quattrocchi, Minimum embedding of Steiner triple systems into  $(K_4 \setminus e)$ -designs, *Discrete Math.*, in press (doi:10.1016/j.disc.2007.09.038).
- Lucia Gionfriddo, Two constructions for perfect hexagon triple systems, *Bull. Inst. Combin. Appl.* 48 (2006) 73–81. [MR2259705](#)
- T.P. Kirkman, On a problem in combinatorics, *Cambridge and Dublin Math. J.* 2 (1987) 191–204.
- S. Küçükçifçi, C.C. Lindner, Perfect hexagon triple systems, *Discrete Math.* 279 (2004) 325–335. [MR2059998 \(2005m:05045\)](#)

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**Rodger, C.A.; Rogers, Julie**  
**Generalizing Clatworthy group divisible designs.** (English)  
 J. Stat. Plann. Inference 140, No. 9, 2442-2447 (2010).

Summary: A neat construction is provided for three new families of group divisible designs that generalize some designs from the Clatworthy table of the only 11 designs with two associate classes that have block size four, three groups, and replication numbers at most 10. In each case (namely,  $\lambda 1 = 4$  and  $\lambda 2 = 5$ ,  $\lambda 1 = 4$  and  $\lambda 2 = 2$ , and  $\lambda 1 = 8$  and  $\lambda 2 = 4$ ), we have proved that the necessary conditions found are also sufficient for the existence of such GDD's with block size four and three groups, with one possible exception.

**MSC 2010**  
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**Keywords**  
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
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### Christopher Andrew Rodger

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Ph.D. University of Reading 1982 

Dissertation: *Embedding Problems for Latin Squares*

Mathematics Subject Classification: 05—Combinatorics

Advisor: [Anthony J. W. Hilton](#)

Students:

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Name	School	Year	Descendants
<a href="#">Atif Abuzeida</a>	Auburn University	2000	
<a href="#">David Ashe</a>	Auburn University	2000	
<a href="#">B. Ann Cox</a>	Auburn University	1994	
<a href="#">Michael Daven</a>	Auburn University	1999	
<a href="#">Saad El-Zanati</a>	Auburn University	1991	
<a href="#">George Foust</a>	Auburn University	1998	
<a href="#">Carrie Grant</a>	Auburn University	1997	
<a href="#">Sasha Jarrell</a>	Auburn University	2004	
<a href="#">Charles Leach</a>	Auburn University	2002	
<a href="#">James McGee III</a>	Auburn University	2000	
<a href="#">Sibel Ozkan</a>	Auburn University	2007	
<a href="#">David Pike</a>	Auburn University	1996	1
<a href="#">Michael Raines</a>	Auburn University	1997	
<a href="#">Erin Spicer</a>	Auburn University	1995	
<a href="#">Sidney Stubbs IV</a>	Auburn University	1986	
<a href="#">Evan Wantland</a>	Auburn University	1994	

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- `\frac{\alpha}{\gamma}`
- `\tilde{\beta}`
- `\text{\texttt{PE}}`
- `h_S=\frac{2}{\pi}`
- "lepsilon" AND "2\pi"
- "\bar{\delta}\_q" OR "\frac{dw}{dz}"

SAMPLE RESULT

Self-intersections of random walks on lattices  
 Acta Mathematica Hungarica (2002) 96:187-220, August 01, 2002  
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$\nabla^2 \phi_{m1} = \nabla \times \mathbf{B}_1$

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$\nabla \times (\nabla \times \mathbf{B}) = \nabla(\nabla \cdot \mathbf{B}) - \nabla^2 \mathbf{B}$

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**1** result

**The Use of Steady Electromagnetic Fields to Control the Columnar Solidification of Binary-Metal Alloys**  
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$\mathbf{j} = \frac{1}{\mu_0} \nabla \times \mathbf{B}$

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**1** result

**Evaluation of signal space separation via simulation**  
*Medical & Biological Engineering & Computing* (2008) 46:923-932, August 29, 2008

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 **Magneto-hydrodynamic Effects on Insulating Bubbles and Inclusions in the Continuous Casting of Steel**  
J.W. Haverkort and T.W.J. Peeters

**Abstract**

The magneto-hydrodynamic effects associated with a magnetic field perpendicular to the movement of insulating inclusions or bubbles in a conducting liquid are investigated in this article. An increase in drag coefficient as a result of the presence of a magnetic field is argued to have a significant effect on their terminal rise velocity. Inside a continuous steel caster, this lower terminal velocity has a potentially negative effect on the removal rate of unwanted inclusions, degrading the steel quality. Simulations of an insulating rigid sphere moving in the presence of an electrical current show an electromagnetophoretic force per unit volume of  $-\psi \mathbf{j} \times \mathbf{B}$ , with a shape factor  $\psi = 1.0$ . Numerical fluid and dispersed gas phase simulations of the flow inside a submerged entry nozzle show that, because of this force, inhomogeneous magnetic fields can cause nonuniform gas distributions in accordance with a theoretical analysis. In particular, the magnetic field can be tailored to increase or decrease the amount of gas near the side

# Mathematics Research Tools



Open Source - Proprietary

# Computer Algebra System (CAS)

## Proprietary

- ▶ Magma
- ▶ Maple
- ▶ Mathematica
- ▶ MuPad (part of Matlab)

# Computer Algebra System (CAS)

## Open Source

- ▶ Axiom
- ▶ Maxima
- ▶ Sage <http://www.sagemath.org>
- ▶ Singular
- ▶ SymPy (and iPython) <http://code.google.com/p/sympy>  
(also see: <http://www.python.org>,  
<http://www.scipy.org>, <http://ipython.scipy.org>)

## Computer Algebra Systems

[http://en.wikipedia.org/wiki/Computer\\_algebra\\_system](http://en.wikipedia.org/wiki/Computer_algebra_system)

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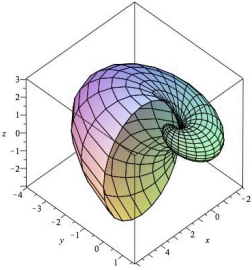
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`int(sin(x)2+x3, x);`

$$-\frac{1}{2} \sin(x) \cos(x) + \frac{1}{2} x + \frac{1}{4} x^4 \quad (1)$$

`with(plots):`

`sphereplot((4/3)theta · sin(phi), theta=-1..2·Pi, phi=0..Pi);`



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# Numerical Computing Environment

## Proprietary

- ▶ Matlab

## Open Source

- ▶ GNU Octave <http://www.gnu.org/software/octave>
- ▶ R <http://www.r-project.org>
- ▶ Scilab <http://www.scilab.org>
- ▶ SciPy <http://www.scipy.org>

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# MATLAB

- ▶ Matrix laboratory
- ▶ Programming language designed for mathematical computation, analysis, visualization, and algorithm development
- ▶ Integrated development environment
- ▶ Applications include: prototyping, graphics, data analysis, GUI development
- ▶ “MATLAB The Language of Technical Computing”
- ▶ “MATLAB and companion toolboxes provide engineers, scientists, mathematicians, and educators with an environment for technical computing applications”

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heat2d.m (MATLAB Function)

Heat diffusion in a slab

- heat2d()
- u0(x, y)
- bcLeft()
- bcRight()
- bcBottom()
- bcTop()

Start

```

36 alpha = K*dt/dx^2;
37 alphay = K*dt/dy^2;
38
39
40 for k=1:n
41     for j=2:m
42         for i=2:l
43             u(i,j,k+1) = alpha*x*u(i-1,j,k) + (1 - 2*alpha - 2*alphay)*u(i,j,k)
44                 + alpha*x*u(i+1,j,k) + alphay*u(i,j-1,k) + alphay*u(i,j+1,k);
45         end
46     end
47 end
48

```

Command Window

```

>> heat2d
ans =
Columns 1 through 4
         0    0.100000000000000    0.200000000000000    0.300000000000000
Columns 5 through 8
0.400000000000000    0.500000000000000    0.600000000000000    0.700000000000000
Columns 9 through 11
0.800000000000000    0.900000000000000    1.000000000000000
fx >>

```

Workspace

Name	Value
ans	<1x11 double>

Figure 1

File Edit View Insert Tools Desktop Window Help

heat2d Ln 40

# Statistics Software

## Proprietary

- ▶ Matlab
- ▶ Minitab
- ▶ SAS
- ▶ SPSS

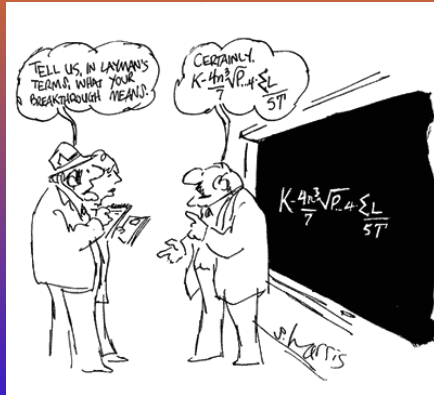
## Open Source

- ▶ R <http://www.r-project.org>

## Statistics Software

[http://en.wikipedia.org/wiki/Statistics\\_software](http://en.wikipedia.org/wiki/Statistics_software)





# Communicating Mathematics

- ▶ Writer's Tools and Recommended Reading
- ▶ Mathematical Writing
- ▶ English Usage
- ▶ When English Is a Foreign Language
- ▶ Writing a Paper
- ▶ Revising a Draft
- ▶ Publishing a Paper
- ▶ Writing and Defending a Thesis
- ▶ Writing a Talk
- ▶ Giving a Talk
- ▶ Preparing a Poster
- ▶ TeX and LaTeX
- ▶ Aids and Resources for Writing and Research

T<sub>E</sub>X

- ▶ T<sub>E</sub>X - created by Donald E. Knuth
- ▶ It is a markup language (typesetting language), in fact a programming language
- ▶ T<sub>E</sub>X (doesn't create an image) it is a page description
- ▶ Designed to create beautiful mathematics documents (papers, books)
- ▶ In the public domain, cross platform, very powerful, complicated, not WYSIWYG (for the most part)

L<sup>A</sup>T<sub>E</sub>X

- ▶ L<sup>A</sup>T<sub>E</sub>X - created by Leslie Lamport
- ▶ L<sup>A</sup>T<sub>E</sub>X is a comprehensive set of markup commands (macros) used with the typesetting program T<sub>E</sub>X
- ▶ In the public domain, cross platform
- ▶ Simplify the use of T<sub>E</sub>X

The Comprehensive TeX Archive Network <http://www.ctan.org>

The TeX Users Group <http://www.tug.org>



# Typographical Markup vs. Logical Markup

T<sub>E</sub>X - Typographical Markup

He took a **bold step** forward

He took a <b>bold step</b> forward

html

He took a {\bf bold step} forward

TeX

# Typographical Markup vs. Logical Markup

LaTeX - Logical Markup

## Logical Markup

```
<h1>Logical Markup</h1>
```

html

```
\title{Logical Markup}
```

LaTeX

He took a *bold step* forward

```
He took a <em>bold step</em> forward
```

html

```
He took a \emph{bold step} forward
```

TeX

# Examples

A displayed equation

$$b(t) = \int_{-\infty}^{\infty} k(t, s)a(s)ds$$

```
\begin{displaymath}
b(t)=\int_{-\infty}^{\infty}
k(t, s) a(s) ds.
\end{displaymath}
```

An inline equation  $b(t) = \int_{-\infty}^{\infty} k(t, s)a(s)ds$

```
$b(t)=\int_{-\infty}^{\infty}
k(t, s) a(s) ds$
```

# Examples

$$f_n = \sum_{m=-\infty}^{\infty} k_{n-m}g_m = (k \star g)_n \quad (1)$$

Recall equation (1)

# Examples

$$K = \begin{bmatrix} k_0 & k_{N-1} & \dots & k_1 \\ k_1 & k_0 & \dots & k_2 \\ \vdots & \vdots & \ddots & \vdots \\ k_{N-1} & k_{N-2} & \dots & k_0 \end{bmatrix}_{N \times N}$$

```
\begin{displaymath}
K = \left[ \begin{array}{cccc}
k_0 & k_{N-1} & \dots & k_1 \\
k_1 & k_0 & \dots & k_2 \\
\vdots & \vdots & \ddots & \vdots \\
k_{N-1} & k_{N-2} & \dots & k_0
\end{array} \right]_{N \times N}
\end{displaymath}
```

# Examples

Table 7.4: Plant data for both units.

	Unit 1	Unit 2
Fresh feed flow rate, kg/s	16.782	13.476
Recycle HCO flow rate, kg/s	2.108	2.111
Combined feed ratio, CFR	1.1256	1.1566
Air feed temperature, K	436.	433
Hydrogen in coke, wt%	4.17	6.79

# Examples

Table 7.4: Plant data for both units.

```
\medskip
```

```
\begin{tabular}{@{}lr@{.}lr@{}}\hline~&\multicolumn{2}{c}{\quad$ Unit 1} &\multicolumn{2}{c}{\quad$ Unit 2}\\ \hlineFresh feed flow rate, kg/s & \quad$ & 16&782 & \quad$ & 13.476\\ \hlineRecycle HCO flow rate, kg/s & & 2&108 & & 2.111\\ \hlineCombined feed ratio,CFR&1&1256&1.1566\\ \hlineAir feed temperature, K&436&~&433\\ \hlineHydrogen in coke, wt\%&4&17&6.79\\ \hline\end{tabular}
```

- ▶ Presentations, colors, transitions
- ▶ Output formats pdf, ps
- ▶ Graphics
- ▶ Charts, tables, and diagrams
- ▶ Processors, viewers/previewers, and front-ends, device drivers
- ▶ Style files, journal specific style files, book publishers
- ▶ Environments
  - ▶ T<sub>E</sub>XShop - <http://pages.uoregon.edu/koch/texshop>
  - ▶ T<sub>E</sub>XWorks - <http://tug.org/texworks>
- ▶ Bibliographic Database Managers
  - ▶ BibDesk - <http://bibdesk.sourceforge.net>
  - ▶ JabRef - <http://jabref.sourceforge.net>



# TeX Environments

TeXShop

The image shows a TeXShop window titled 'GradSeminar2010.tex' with a slide titled 'TeX/LaTeX Add-Ons'. The slide lists several categories of add-ons:

- ▶ Presentations, colors, transitions
- ▶ Output formats pdf, ps
- ▶ Graphics
- ▶ Charts, tables, and diagrams
- ▶ Processors, viewers/previewers, and front-ends, device drivers
- ▶ Style files, journal specific style files, book publishers

Below the slide is a smaller window titled 'TeX Environments TeXShop' which shows the same slide content in a smaller view.

The TeXShop editor shows the following LaTeX code:

```
670 Combined lead ratio,LP-H&1&125&1.15b%
671 Air feed temperature, K&436&-&433%
672 Hydrogen in coke, wt%&4&17&6.79%
673 \line\end{tabular}%
674 \end{verbatim}
675
676 \fill
677 \end{frame}
678
679
680 \begin{frame}
681 \framestyle{\TeX\LaTeX Add-Ons}
682
683 \begin{itemize}
684 \item{Presentations, colors, transitions}
685 \item{Output formats pdf, ps}
686 \item{Graphics}
687 \item{Charts, tables, and diagrams}
688 \item{Processors, viewers/previewers, and front-ends, device drivers}
689 \item{Style files, journal specific style files, book publishers}
690 \end{itemize}
691
692 \fill
693 \end{frame}
694
695
696 \begin{frame}
697 \framestyle{\TeX} Environments
698 \framesubtitle{\TeX Shop}
699
```

The TeX Live console shows the following error messages:

```
Underfull \vbox (badness 10000) has occurred while \output is active [52]
Underfull \vbox (badness 10000) has occurred while \output is active [53]
Underfull \vbox (badness 10000) has occurred while \output is active [54]
Underfull \vbox (badness 10000) has occurred while \output is active [55]
[56] (</GradSeminar2010.aux>
LaTeX Font Warning: Size substitutions with differences
(Font) up to 1.0pt have occurred.
)
(see the transcript file for additional information)~usr/local/texlive/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms18-pfb->usr/local/texlive/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms18-pfb->usr/local/texlive/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms18-pfb->usr/local/texlive/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms12-pfb->usr/local/texlive/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms9-pfb->us
r/local/texlive/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms18-pfb->usr/local
/texlive/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms18-pfb->usr/local/texlive
/2008/te
xmf-dist/fonts/type1/biueasy/cw/cms18-pfb->usr/local/texlive/2008/te
```

LyX: ~/example.lyx (changed)

File Edit Insert Layout View Navigate Documents Help

Standard

you can now refer back to the picture as Figure 1. Let's now add a small table:

Rocks	Minerals
Granite	Mica
Sandstone	Quartz

Now we come to one of LyX's real strengths: mathematical equations. The most beautiful equation in mathematics

foot according to some mathematicians -- I'm just a dumb scientist.

is  $e^{i\pi} + 1 = 0$ . Ugly equations as the integral of  $1/x$  can be written as

$$\int \frac{dx}{x} = \ln|x| + C$$

Font: Default

file:/tmp/lyx/lyx\_tmpdir/5639Du1seM/lyx\_tmpdir/example.tex - KViewShell

Datei Ansicht Seite zu Bearbeiten Einstellungen Hilfe

125%




Figure 1: This is a picture of a platypus.

## 2 Other Stuff

The following is the famous platypus EPS file:

We can now refer back to the picture as Figure 1. Let's now add a small table:

Rocks	Minerals
Granite	Mica
Sandstone	Quartz

Now we come to one of LyX's real strengths: mathematical equations. The most beautiful equation in mathematics<sup>1</sup> is  $e^{i\pi} + 1 = 0$ . Ugly equations as the integral of  $1/x$  can be written as

$$\int \frac{dx}{x} = \ln|x| + C.$$

<sup>1</sup>according to some mathematicians -- I'm just a dumb scientist.

2

Seite 2 von 2 | 125% | DIN A1/Portrait

demo.tm

Buffer File Edit Insert Text Paragraph Document Project Options Help

$\div$   $\sqrt{\quad}$   $\sqrt[3]{\quad}$   $*$   $*$   $*$   $\wedge$   $\Sigma$  ( | )  $\alpha$   $\otimes$   $\leftarrow$   $\rightarrow$   $\varphi$  **B** **C**  $\mathfrak{F}$  **B**

**Theorem 1.1.** *This is a little theorem.*

**Proof.** The proof is based on the formula

$$a^2 + b^{2x} = c^2 + \frac{a + b + C + X + Xab}{c + \frac{a}{b} + \frac{e}{f + \frac{a}{b}}} + \frac{x}{y} + e^{e^{e^{e^x}}} \quad (1.1)$$

From (1.1), it follows that

$$x \rightarrow y \rightarrow z + \left[ \sum_{i=1}^{\infty} a_i \left| \otimes_{i=1}^{\infty} c_i \right| \sum_{i=1}^{\infty} b_i \right] \quad (1.2)$$

The proof is illustrated by

article math roman 10 red proof equation denominator fraction

# Bibliographic Databases

BibDesk

The screenshot shows the BibDesk application window titled "MathTools.bib". The interface includes a menu bar with "Action", "New", "Edit", "Delete", and "TeX Preview". A search bar labeled "Search Bibliography" is present. The main area is divided into a left sidebar with "GROUPS" (Library, EXTERNAL, SMART, STATIC, KEYWORDS) and a central list of entries. The selected entry is "Gratzer2009a". A detailed view of this entry is shown below the list, including fields for Author, Journal, Year, Volume, Number, and Pages. A "Cite Drawer" on the right shows a PDF icon and a URL.

Keyword	BibTeX	Cite Key	Title
	roman1998	roman1998	reviews: handbook of writing for the mathemat...
	book	Cillman1987	Writing Mathematics Well: A Manual for Authors
	book	Goossens1...	The LaTeX Web Companion: Integrating TeX, HT...
	book	Goossens2...	The LaTeX Graphics Companion
	book	Gratzer2007	More Math Into \LaTeX
	article	Gratzer2009a	What Is New in \LaTeX? I. Breaking Free
	article	Gratzer2009b	What Is New in \LaTeX? II. \TeX Implementations...
	article	Gratzer2009c	What Is New in \LaTeX? III. Formatting References
	book	Griffiths1997	Learning \LaTeX
	article	Hefferon2009	The TEX Family in 2009
	article	Hersh1997	Math Lingo vs. Plain English: Double Entendre
	book	Higham1998	Handbook of writing for the mathematical sciences

Gratzer2009a  
**What Is New in \LaTeX? I. Breaking Free** (article)  
**Author** George Gr\atzer  
**Journal** Notices Amer. Math. Soc.  
**Year** 2009  
**Volume** 56  
**Number** 1  
**Pages** 52--54

PDF  
<http://www.am...>  
What Is New in \La...

38 publications

# Bibliographic Databases

BibDesk

What Is New in  $\LaTeX$ ? I. Breaking Free

BibTeX Annote Abstract RSS-Description

Cite Key: Gratzer2009a article

Author: George Grätzer

Title: What Is New in  $\LaTeX$ ? (I.) [B]reaking Free

Journal: Notices Amer. Math. Soc.

Year: 2009

Volume: 56

Number: 1

Pages: 52--54

Month:

Keywords:

Url: <http://www.ams.org/notices/200901/tx090100052p.pdf>

Rating  Read

PDF icon: <http://www.ams.org/noti...>

G. Grätzer

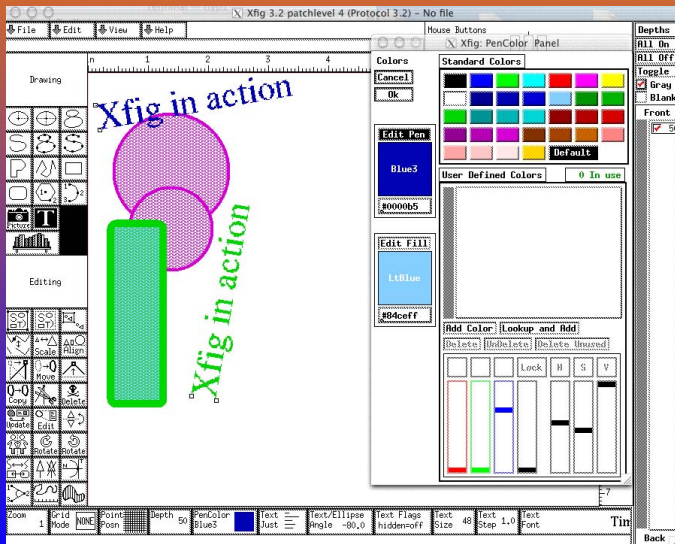
LaTeX Preview

[1] G. Grätzer. What is new in  $\LaTeX$ ? I. Breaking free. *Notices Amer. Math. Soc.*, 56(1):52-54, 2009.

100%

# Drawing Environments

Xfig



# Unix-Like Environments

## Cygwin

The screenshot displays a Windows desktop with a Cygwin environment. A terminal window shows an error message: "Your username or group hasn't been setup correctly. This typically happens if you are a domain user (cygwin does not automatically create /etc/passwd or /etc/group for domain users)". Below this, the user is in a shell prompt: "herold@aerosmith ~" with the command "\$ emacs" and its output "[1] 2544".

An Emacs window is open, displaying the GNU Emacs logo and version information: "GNU Emacs is one component of the GNU operating system. You can do basic editing with the menu bar and scroll bar using the mouse." It also lists "Useful File menu items:" such as "Exit Emacs" and "Recover Session". A context menu is open over the Emacs window, showing options like "Reload .XWinrc", "Applications", "Show Root Window", and "Exit".

An xterm window is also visible, showing a shell prompt: "bash-2.0506".

At the bottom, the Windows taskbar shows the Start button and several open windows: "Cygwin/x - Develop...", "xterm", and "emacs@aerosmith.AJ...". The system tray shows the time as "11:33 AM".

Released: 2003-08-27 1505 EDT  
Committed to XFree86 CVS: not yet  
Basis: Release 95  
Cygwin setup.exe package: XFree86-xse  
Download source: [xwin-20030827-1505.g](#)  
Download [xcl/programs/Xserver/tw/xwin](#)  
Changes:

- winprefs\* - Add a system to allow shortcuts) as well as custom icons are stored in ~/.XWinrc or in /usr/Philhower III)
- winmultwindowclass.c - Fix a str people. (Earle F. Philhower III)
- winconfig.c - Add new defaults for

Release 95

Released: 2003-08-02 2115 EDT  
Committed to XFree86 CVS: not yet

<http://www.msu.edu/~huntrho/xwin/develop/server/example.XWinrc>

# Virtual Software Delivery

“COSAM is using advances in virtualization technology to help it manage software better and to facilitate the delivery and instructional use of software to the faculty, staff, and students in the college.”

For information see:

<http://www.auburn.edu/academic/cosam/departments/it/software>

<http://www.auburn.edu/academic/cosam/departments/it/software/appv>

<http://www.auburn.edu/academic/cosam/departments/it/software/vmwareviewer>



# Virtual Software Delivery

The screenshot shows a web browser window displaying the Auburn University COSAM IT website. The browser's address bar shows the URL <http://www.auburn.edu/academic/cosam/departments/it/software/>. The website header includes navigation links: "A to Z Index", "Campus Map", "People Finder", "Search", and "Quick Links". The main navigation bar lists "Academic Departments", "Student Services", "Alumni", "Research", "Outreach", and "Diversity". The page title is "Instructional Technology" for the "College of Sciences & Mathematics".

The left sidebar contains a navigation menu with the following items: "COSAM", "Departments", "Instructional Technology", "Software", "Application Virtualization (App-V)", "VMware Viewer", "Sophos", "Cisco VPN Client", "Fetch FTP Client (Mac)", "MS Office 2008 (Mac)", and "Available Software".

The main content area features the following sections:

- Software**

COSAM is using advances in virtualization technology to help it manage software better and to facilitate the delivery and instructional use of software to the faculty, staff, and students in the college. Instead of physically installing the software on the physical computers, the preferred method is to make software available via virtualization as described below.
- Instructional Classrooms**

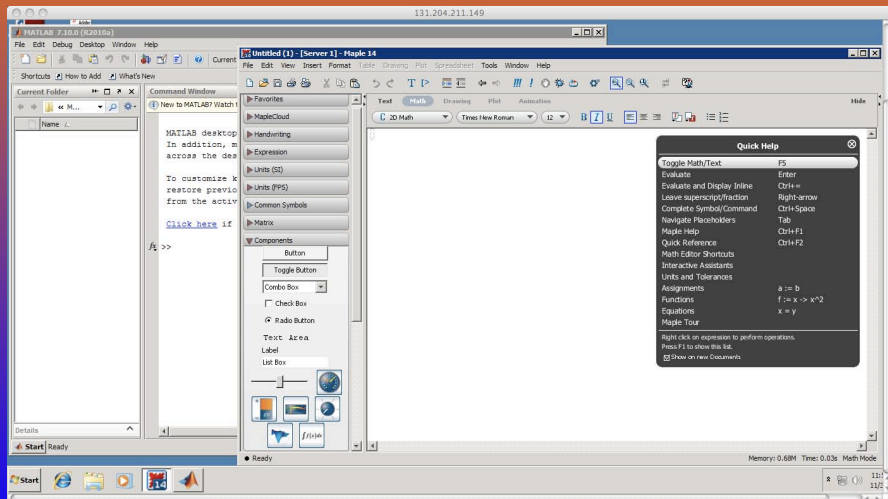
The COSAM IT group has implemented changes to most of the technology classrooms in the college. The rooms affected are Rouse 112; Chemistry 134, 151, 156; SCC 115, 118, 122; SCA; all Parker Hall (with the exceptions of 126 and the physics labs), and the conference room SCC 202. We reinstalled the operating system on all the computers and changed the delivery system for the software. The software installed on any of the classroom computers is limited to basic PowerPoint and word viewers. All other software that a faculty member is licensed to use is delivered via virtualization regardless of the classroom they are teaching in. This change will better allow us to manage the software that is available to the faculty and graduate teaching assistants. It will also give a more consistent user environment.

Instructors will find most of the software they are authorized to use in the programs folder under the folder named app-v. All classroom computers also have the VMware view client on the desktop. Clicking on this will launch a virtual machine which may be necessary to run some software as many classroom computers have limitations.

Files stored on the local desktop, favorites, and my doc of any classroom computer or the virtual computer will be available to each user regardless of the computer used or its COSAM location for the duration of the semester. This includes both the physical computers and the virtual computers. The instructor will have a choice of using either the local physical computer or launching a virtual computer depending on what works best for them.
- Faculty and Staff**

The faculty/instructor will be able to install VMware View client on their office desktop/laptop so they can connect to the virtual computer (i.e. Class pool) from outside the classroom to prepare for class. Faculty can copy material (files, programs, etc.) to the virtual computers desktop or my docs and they will appear in the same place on their classroom computer when they log in. If the user is off campus then a VPN connection is required. Faculty running a Windows OS may also want to install the Virtual Application client (App-V client) on their office desktop/laptop to access the

# Virtual Software Delivery





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Young mathematicians network.