

Mathematica Tips, Tricks, and Techniques

Getting Started

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Contents

1	First Things First.	2
1.1	I'm sitting at the PC. Now what? How do I start <i>Mathematica</i> ?	2
1.2	HELP! HELP! How do I get HELP?	2
1.3	I'm lost! How do I find information about what directory I'm in—and how do I change directories?	2
1.4	I've don't want to lose my work! How do I save my notebook?	3
1.5	My files are too big to fit on my floppy! What do I do?	3
2	You're on your way.	3
2.1	How do I access packages and other goodies especially prepared for this course?	3
2.2	How do I find out which packages I've loaded?	3
2.3	How do I find out what options are available for a given <i>Mathematica</i> command?	3
3	Getting Your Act Together.	4
3.1	I'm deep into a <i>Mathematica</i> session. How do I find out what variables and expressions I've already defined?	4
3.2	I want to be sure I'm not using outdated definitions. How do I clear definitions of expressions I've defined?	4
3.3	<i>Mathematica</i> is taking too darn long to execute my command. Can I abort this command without losing all my work?	4
3.4	Augh! <i>Mathematica</i> is running amok! How do I stop it!	4
3.5	<i>Mathematica</i> is executing my notebook and giving me screwy results? Am I doomed?	5

1 First Things First.

1.1 I'm sitting at the PC. Now what? How do I start *Mathematica*?

Find the *Mathematica* icon on the desktop. Double-click it.

Doing so will bring up the *Front End* and a new notebook but won't initialize the *kernel*. The first command you enter (by typing a command in the notebook, then hitting **Shift-Enter**) initializes the kernel.

Tip If you can't find the icon, click on the **Start** button in the lower left hand corner. Then click on **Programs** to bring up a menu of available programs. The shortcut to start *Mathematica* is under **Start / Programs / Mathematica 3.0**.
Be sure to click on the Mathematica icon, not the kernel icon.

1.2 HELP! HELP! How do I get HELP?

Use the Help Browser.
(You can also highlight the command name with your mouse, then hit F1.)

If you just want a quick refresher on a command, enter `?<command>` in your notebook. If you can't remember the precise syntax of a command or its arguments, use the **Complete Selection** item under the **Input** menu.

Getting (lots of) help could hardly be simpler. Click on **Help** to invoke the help menu, then click on the word **Help** to bring up the Browser. This is a fantastic resource, far better than the on-line help in any other program I know. It contains the entire text of *The Mathematical Book, Version 3*, complete descriptions of all built-in commands and packages (under **Add-ons**), an excellent guide to learning *Mathematica* and cool demos (under **Getting Started/Demos**), and a superb index. In addition to detailed information about all *Mathematica* commands, the browser contains lots of examples *which you can copy and then use in your own work*. You owe it to yourself to spend some time poking around in the Browser and to use it extensively!

Tip When you first invoke the help browser, it is preset to access only built-in functions. If you want information about anything else or don't know whether your function is built in, click the dot under **Master Index**. That gives you access to everything!

Tip You can use the inquire command `?` with wildcards (`*`), by typing `?Plot*`.

1.3 I'm lost! How do I find information about what directory I'm in—and how do I change directories?

To ask *Mathematica* what directory it's in, type `Directory[]`.
To change directories, type `SetDirectory[<directoryname>]`.

Warning When you initiate *Mathematica*, it will not be in your working directory. You must tell *Mathematica* to switch to your directory or you won't be able to access packages, data files, or notebooks you've stored in that directory.

Tip Make `SetDirectory[]` the first command in every notebook.

Tip To list *all* files in the directory, execute the command `FileNames[]`.

Tip Use wildcards with `FileNames[]` to determine all files of a certain type. For instance, list the names of all files with the extension `*.m`, type `FileNames["*.m"]` (note the quotation marks).

1.4 I've don't want to lose my work! How do I save my notebook?

Click on the File menu and use Save As. You will be asked for the name you want to assign to your notebook.

Warning Unless you're sure that you're in your working directory, you must give *Mathematica* the full file name, including the directory where you want the file stored.

1.5 My files are too big to fit on my floppy! What do I do?

Zip your notebooks, using WinZip, which you can invoke through an icon on the Desktop or through the Programs menu.

Warning Do not leave a valuable notebook in your working directory under the assumption that it will be there the next time you visit the PC lab. These directories are not protected. Moreover, a little gremlin periodically cleans out the working discs when they become full of crud. Always copy any work you want to keep onto your floppy before leaving the PC lab.

You'll probably find that your notebooks exceed the capacity of a 1.44 MB floppy, especially if you use graphics extensively. You can use any compression program to (safely) compress your notebooks prior to copying them to your floppy. Later you just uncompress them. WinZip does this all through easy-to-use menus and has on-line help that will instruct you in its use. (Don't forget to unzip your notebook before you next try to load it into *Mathematica*.)

I can offer one other way to decrease the size of your files. Under the Kernel menu you'll find an entry with the ominous sounding name "Delete All Output." Although at first glance this sounds like a ghastly option, it's fine for *storing* your notebooks, since you can always regenerate them at a later time. And it will dramatically shrink the size of (huge) notebooks.

2 You're on your way.

2.1 How do I access packages and other goodies especially prepared for this course?

Use the Windows Explorer to go to the directory g:\Phys3113. Copy whatever you want into your working directory. Feel free to modify these packages and notebooks at will; many of them should be useful to you in future courses.

2.2 How do I find out which packages I've loaded?

To get a list of the packages, type \$Packages.

2.3 How do I find out what options are available for a given *Mathematica* command?

The Help Browser contains all the detail you need.

If you want a quick list of options and their default values, type Option[<command>].

Tip If you don't like the current value of an option, you can change it using SetOptions. For instance, I like to draft a box (a "frame") around my graphs. By default, *Mathematica* draws only axes, because it's built-in default is Frame->False. So I often change this default for all Plot commands I intend to enter in my notebook by typing

```
SetOptions[Plot, PlotPoints->50]
```

If I want to draw axes instead of a frame for a particular plot command, say a graph of $\sin^2 x$, I can change the default within the Plot command by typing

```
Plot[Sin[x]^2, {x,0,Pi}, PlotPoints->50]
```

3 Getting Your Act Together.

3.1 I'm deep into a *Mathematica* session. How do I find out what variables and expressions I've already defined?

To list the names of all variables, functions, etc. you've defined during the current *Mathematica* session, type either `?Global`*`` or `Names["Global`*"]`.

Warning Context names are *Mathematica* "strings" and so must be enclosed in quotation marks when used in commands like `Names` or `Needs`. So don't forget the apostrophe—that's the doohickey on the key in the upper left-hand corner, the one with the tilde *not* the single quote mark, which appears on the key to the left of the ENTER key—after the word `Global`; it's part of the "context name."

Warning The command `Names["Global`*"]` produces a *Mathematica* list of the names in the Global context. If you type `Names["*"]`, you get a (huge) list of all commands, including *Mathematica*'s system commands, which will fill your notebook with useless junk.

3.2 I want to be sure I'm not using outdated definitions. How do I clear definitions of expressions I've defined?

To clear all definitions of quantities you've introduced in a *Mathematica* session so far, type: `ClearAll["Global`*"]`.

Warning Don't forget the apostrophe after the word `Global`; it's part of the context name.

Tip Make `ClearAll` or the first statement of every notebook, so that if you screw up, you can just re-evaluate the whole notebook from scratch, using the `Evaluate Notebook` menu item in the `Kernel` menu.

Tip The command `ClearAll` clears definitions and attributes. If you want to clear just the definitions, use `Clear` instead.

Tip This command removes all definitions and attributes of commands but does not force *Mathematica* to forget the name of the command. To accomplish that, use `Remove`. To actually *remove* all variable names you've defined, type `Remove["Global`*"]`.

Tip Executing a global `Remove` will probably resolve 99% of the problems may encounter due to variable conflicts.

3.3 *Mathematica* is taking too darn long to execute my command. Can I abort this command without losing all my work?

Almost certainly. Go to the `Kernel` menu and select `Abort Evaluation`. Alternatively, hold down the `Alt` key and hit the period.

Tip *Mathematica* may take a minute or so to back out of what it's doing and restore your notebook. Don't get impatient. On the other hand, sometimes *Mathematica* is having so much fun evaluating your command that it won't stop (e.g., during rendering of complicated graphics.) If it refuses to abort the calculation, proceed to the next `Tip` for more drastic measures.

3.4 Augh! *Mathematica* is running amok! How do I stop it!

If you can't abort the currently running command, then you have to kill the kernel. Go to the `Kernel` menu, find `Quit Kernel`, and click on `Local` (or whatever kernel you're using), and answer according when *Mathematica* asks if you really want to quit.

Warning Killing the kernel will force *Mathematica* to stop *but will not automatically save your notebook*. Unless you're so sick of what you're doing that you don't want to save your notebook, be sure to do so *now*.

3.5 *Mathematica is executing my notebook and giving me screwy results? Am I doomed?*

No. If *Mathematica* seems not to properly execute your notebook, try saving the notebook to disc, shutting down *Mathematica*, reloading it, and using the Kernel-¿Execute Notebook menu to see if it works. Sometimes, like all of us, *Mathematica* just gets confused.