

Math 2250
MAPLE TUTORIAL and PROJECT I HINTS
Fall 2003

This document is a tutorial for Math 2250 students who may not have done previous work with MAPLE or in the Math lab, or who may just want to brush up on their skills. At the end of the tutorial there is an introduction to the first project. Links to the precise template for your project answers and to an on-line version of this tutorial can be found at the home page for 2250 maple projects, <http://www.math.utah.edu/~korevaar/2250fall03/2250maple.html>

The Math 2250 projects can be done in versions five and above of Maple, with minor changes. The Math Lab, EMCB, and Marriott Library all have version 8 of Maple. A student version of Maple 9, for home computers is available from the bookstore for \$129.95.

1) Using the Math Computer Lab:

The Math Department has a walk-in computer lab in the Math Student Center, located underneath the plaza connecting JWB to LCB. There is also a computer classroom in LCB 115, where introductory tutorials will be held. Useful information about most aspects of the lab can be found by following links from the Math Department web pages, e.g. starting at <http://www.math.utah.edu/ugrad>, or <http://www.math.utah.edu/ugrad/lab>. You can find out about lab hours, X-windows, Maple, Unix commands, Netscape, file editing, mail, etc.

You can access Math Department Maple (in its own window as opposed to the cumbersome line command form) remotely from a linux/unix system, from a mac running OSX (download the free X11 xwindows from Apple), or from a PC running windows if you have ssh client capabilities and xwindows capabilities. Apparently there is a free package for PC's called cygwin which you can download to enable this. You do not want to try remote access of Maple with only a modem connection, it will be unbearably slow.

1a) Logging on:

Almost all students who are registered in Math 2250, or in any other math class, will already have accounts set up in our lab. Since these accounts are created from University class lists, late-registering students may not be accounted for. If you fit in this case the lab assistant can help you apply for an account - provided you have brought your student I.D. to show that you are a University student.

The lab machines are left on - move the mouse or hit a key to wake yours up. There should be a box asking for your login name, and then for you password.

Your login name will be of the form c-azbc, where 'a', 'b', 'c' are your last, first, and middle initial, respectively and 'z' is the last letter in your last name. For example, if your name is Ulysses Attila Eratosthenes, your login name will be c-esua. (Many people have the same initials, to ensure your login name is unique, a digit may be added after the initials, eg. c-esua1, c-esua2, ...). For people with more complex (eg. hyphenated names) only the first character of each name is used.

Passwords Your initial password will be the letters as in the login name, followed by the last four digits of your University ID number (e.g., if your UID is 123456789 and your login name is c-esua, then your

password is esua6789) or if the login name is c-esua2 the password is still esua6789).

Once you're logged in, the default environment of our unix-based system is called the common desktop environment, and you will see a maple leaf icon for MAPLE, as well as a NETSCAPE icon. You can open these programs by clicking on the icons.

1b) Changing password: Upon first logging in you should change your password. To do so, log in, open an xterm window, then type "passwd" (followed by RETURN). If there is a problem here try typing "passwd" followed by your username (eg. "passwd c-esua"). Next type your old password (the one you used to login), and then type your new desired password twice as instructed. Your new password is effective within 30 minutes. If you forget your password, request a new one (from the Lab Assistant). Your password must consist of at least 6 characters (upper and lower case letters, and digits). You should take care to choose one that is very difficult to guess, and keep it to yourself!

1c) Logging out: In CDE there is a logout or exit icon at the bottom of your desktop. You might also be able to find it on your right mouse button, after putting your mouse cursor in a background field.

2) Opening netscape, maple, mail, more:

For your Math 2250 purposes you need to be able to open Netscape (to download files) and Maple (to work on them). Open Netscape and Maple now: in CDE use the icons at the bottom of the desktop. Alternately, you can open an xterm window and type the commands **netscape &**, followed by <ENTER>, as well as **xmaple &**, followed by <ENTER>. The **&** tells X-windows to create separate windows for each process.

3) Maple:

If you are starting the tutorial at this point (because you're doing it on your own at another location or already knew the Math Lab system), you should have opened a maple window, probably version 8 (versions 5,6,7, 9 should also work), as well as a web browser.

Maple is partly just a very fancy calculator; it can do practically any undergraduate mathematics computation or symbolic manipulation. You can write programs in Maple and draw pictures as well. But you can also use it to create documents which mix text with computations, and you can export Maple output to other software to create interesting documents.

If you are doing a homework assignment you can intersperse text with computations using the toolbar: to get a computation prompt click on the "[>" box near the top. To insert text click on the "T" box. Or you can change command fields (starting with "[>") into text fields by putting the cursor into them and then choosing "T". You can use the mouse to cut, paste, and edit a document. You can change fonts, formats, and use other standard text editing tools by choosing appropriate menu items. This document you are reading is a Maple document even though it is largely text. You will learn by doing - and by asking your neighbor or the lab assistant.

New User's Tour and more:

Under the Help button at the top right of your Maple window you will find the choice "New User's Tour". This is a good way to learn generally about what Maple can do. After making this menu choice Maple may hide the beginning of the tour behind other active windows; use the "Window" menu item to bring the tour window to the front. If you wish you can explore now, or you can continue with the

Math 2250 notes below and come back to the tour later. To close the new tour (or any other top window), use the "close" option inside the "file" menu item. To keep the tour open but bring another window to the front, use "window" menu item.

Another good introduction to Maple is located at <http://www.math.utah.edu/~gardiner/Intro.mws>. If you have a browser open you can open Maple files directly off the internet by using clicking successively on **File -> Open URL**, in the Maple menu items at the top of the Maple window. Alternately you can save .mws files from your browser and then open them from Maple.

Entering Maple commands:

To give you a brief taste of what Maple can do, we will try a few commands. Move your cursor into the "Untitled" (new) Maple window which you created in step (2). Commands begin on lines having a command prompt ">", and should be ended with either a semicolon ; or a colon : If you end with a semicolon you will see visible output, if you end with a colon the output will be suppressed even though the command is executed. Maple will not execute a command until you type the "return" or "enter" key. **If you have a multiline command use "shift-return" to change lines without executing.**

If you incorrectly align parentheses or brackets, or do something else which makes your command unexecutable you will get a "syntax error" message and Maple will try to point out your mistake with the cursor and cryptic diagnostic phrases. After a while you will become good at fixing these mistakes but they can be annoying at first. Spaces are ignored in Maple, so you may use them to make input easier to read. You can enter explanatory comments in a command line by inserting a "#" to the left of the comments; Maple ignores any text after the #. Sometimes this is more informative than entering nearby explanatory text, especially if you are explaining various steps in a subroutine.

Now, let's try some commands. (You try just the math commands, the editorial comments were only added to explain what the particular commands are illustrating !) Check that you understand what each command is doing.