

NEW USERS MAY READ THIS SIDE BEFORE STARTING. PLEASE DON'T READ THE OTHER SIDE UNTIL LATER. IT MAY BE CONFUSING NOW.

[COURSE] **Goals of showing Maple to students** [DATE]

Students should know about Maple, and I would like to help them learn about Maple as soon as possible. My ambitions are to show students the program, to equip them with the ability to run some commands, and to work with the extensive Maple “help” facilities. I want them to feel confident that the system will obey them. I also want them to commit and recover from some of the simple errors that everyone makes when first using such a complex program, and to make these errors in what I hoped would be an environment which would be both emotionally and intellectually supportive.

What follows are four sheets of instructions covering, in turn, arithmetic, algebra, calculus, and graphing. I recommend that students work in pairs at two adjoining computers. Both partners should work through each sheet, helping each other when necessary (and such help likely *will* be necessary, since the instructions are rather minimal!). The students should begin each sheet together. Thus one student may need to wait (and help) if their partner is slower to complete one of the sheets.

Students should at least think of Maple as an effective symbolic and graphical and numerical “calculator”. It is another resource which can help them do homework and can help them communicate technical information. I do *not* discuss Maple’s capabilities for running user programs and only suggest that Maple can be a valuable **experimental tool** for investigating mathematics.

Local Rutgers note

The simplest way to begin is at a Rutgers computer lab. Please login, and click on **Start** (lower left), then **All programs**, then **Class software**, and, finally, **Maple 10**. Then begin with the algebra page.

Maple is available on eden and you may be able to use it remotely. Also there is a student edition which can be bought, but see how you like the program first.

Disclaimer! Non-advertisement!! Important information!!!

Symbolic manipulation programs such as Maple are becoming increasingly available. Other popular programs with about the same capabilities are *derive* and *mathematica* and there are many special purpose programs in various fields of science, engineering, and mathematics which have extensive “intelligence” to analyze models. We’re considering Maple here because Rutgers has a site license for this program, and it should be generally available on Rutgers systems. The specific instructions won’t be the same from program to program, but many of the same ideas will be present. Students should expect to have a machine do tiresome or elaborate symbolic computations as well as numerical computations. Please note that many of Maple’s capabilities are also available through *matlab*.

[COURSE] PLEASE: NEW Maple USERS SHOULD WORK THROUGH THE OTHER PAGES FIRST. THEN READ WHAT'S BELOW. [DATE]

The Maple 10 GUI compared to the command line version and older editions of Maple

xmaple gives a graphical user interface (GUI) to the Maple program. Maple can also be used by typing *maple* at any command line. Then the commands and responses are all in ASCII characters. The plotting commands have limited responses, of course. Everyone at some time may need to use the command line version. Good displays may not be available, or there may be limited bandwidth between the user and the CPU. Images usually take many more bits than characters.

Commands in the GUI need not end with a semicolon to be executed. This is important, and can be rather frustrating to naive users of the command line interface: typing *3+2* gets no response! Commands *must* end with a semicolon to be executed.

Another significant difference affects Maple names indirectly. A Maple help page states:

A **name** in its simplest form is a letter followed by zero or more letters, digits, and underscore characters, with lowercase and uppercase letters distinct.

Example The input is *3x RET* (here **RET** means "Press the enter key.").

Maple 10's GUI response *3·x* is displayed and this is interpreted as 3 multiplied by x. **Command line response** *3x* and *3x;* get **syntax error, missing operator or ` ;`** and the program does nothing further.

The GUI allows some implied use of *. The GUI response to the string *int(x^2↓sin(x),x)* (here ↓ means the down arrow key) is the correct antiderivative. But *int(x^2↓3sin(x),x)* gets **Error, missing operation** and *diff(x*3sin(x),x)* does not get the correct response: the string *3sin(x)* is not differentiated at all, even though the command *diff(3sin(x),x)* is interpreted correctly! To a casual user, this seems an annoying inconsistency. I recommend that students type * whenever they want to indicate multiplication.

Example The input is *10^2+1; RET* .

Maple 10's GUI response **Error, invalid power** so Maple interpreted the input as 10^{2+1} . **Command line response** *101* is displayed, the value of $10^2 + 1$ computed by Maple. The GUI continues exponentiation (superscript) and subscript until the user indicates otherwise. *a_2+1;* is $a_2 + 1$ in the command line version but gives a GUI error message.

Output differences

We used *>2^(2^(2^2))*; to show why a displayed result may not be useful (with : rather than ;). The command line interface (on a fast enough computer!) gives all the result's 19,729 decimal digits. The GUI shows the initial 100 digits, then the character string *...19529 digits...* and then the last 100 digits. Since $19,729 = 100 + 19,529 + 100$, things are o.k., but the difference is a bit startling to me*.

The request *int(diff(arctan(x^3),x\$3),x)*; results in different displays. The same answer is shown but Maple's command line abbreviates some algebraic pieces of the answer with %1 and %2. The GUI doesn't bother. Just as in the previous case, this probably can be adjusted by tweaking some preset display parameters, but the defaults are different.

* 10^{9999} displays entirely, but 10^{10^4} does not.