

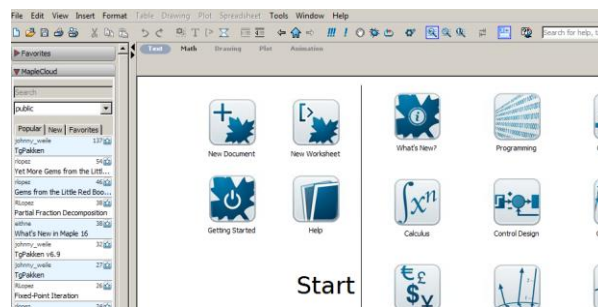


Maple Survival Basics

Maple is a powerful and helpful tool in Mathematics. As with any software, it does exactly what you tell it to do – often a source of frustration. Hence it is important to learn and understand the syntax used in Maple, so you know how to tell it to do what you want. The more you use Maple the more you will realize much of the syntax *actually* makes sense.

To use Maple through the Citrix Server, open the Elmhurst College Portal (<https://my.elmhurst.edu>). **[Note: In the past, Firefox had difficulty opening Maple. But that seems to be fixed].** Click on the Citrix Icon . Click on the Citrix Virtual Apps Button* . If a pop-up Install window appears, click on **Skip to Log on**. Enter your username (enumber) and password to login. Select the Mathematics folder and click on Maple 2018. If a download called **launch.ica** appears, click on it to open Maple. If a pop-up window appears, click on **Permit Use** and/or **Open with Citrix Connection Manager**. You should see a start page similar to the one below:



We have the option of using Maple in Document Mode or Worksheet Mode. Both are very similar in appearance and produce the same output. Dr. Crawford recommends the Worksheet mode. The Worksheet Mode includes a red input prompt for Maple input and the output is labeled, whereas neither occurs in Document Mode. Worksheet Mode is also similar to the Classic Interface used in Maple previous version of Maple. Click on New Worksheet to open a new blank worksheet. Since Maple opens in Document Mode by default, click on File ► New ► Worksheet Mode to get a new sheet in Worksheet Mode or go back to the Start.mw worksheet and click on New Worksheet.

Below are some of the key tips to remember when using Maple:

- If you want more than one command on a line, separate them with a semicolon (;) or colon (:).
The semicolon (;) tells Maple to execute the command and display the output. If you use a colon, it still executes the command, but it will not display the output.
[Maple versions 8 and earlier and the Classic Interface require a colon or semicolon at the end of each line.]
- You must type * for multiplication.
For example, 3 times a must be typed as 3*a, not as 3a nor as 3 a.
- Maple has commonly used predefined constants.
Pi represents the number 3.14..., but Maple will print it as π
I represents the imaginary number $i = \sqrt{-1}$

* If the receiver has not yet been installed on your computer, do NOT click on the large blue Citrix Virtual Apps login button. Instead, click on the Citrix Receiver link found in the paragraph below the button. Follow the directions to install the Receiver. Then go back to the instructions for logging in.

Maple Survival Basics

`infinity` represents ∞

Unfortunately `e` does not represent the number $e=2.718\dots$. To use the value e , you must type `exp(1)`.

- Lower case and upper case letters are not the same.
`x` and `X` are not the same.
`Pi` is the number 3.14..., but `pi` is the Greek letter π (Maple prints them both as π).
`I` is the imaginary number, but `i` is just the letter i – often used as an index.
- Maple has commonly defined functions, such as
`sin(x)`, `cos(x)`, `tan(x)`, `sec(x)`, `csc(x)`, `cot(x)`, `sqrt(x)`, `ln(x)`,
`log(x)`, `exp(x)` – Note: You must type `exp(x)` and not `e^x`. ‘e’ is not one of the predefined constants in Maple. To get the value of $e = 2.718\dots$, use `exp(1)`
- Use `:=` to assign a value or expression (on the RHS) to a name (on the LHS).
 This allows you to refer to the value or expression by its name in future calculations. If you omit the colon and use only the `=`, Maple does not rename it and you can't refer to it later.
`x:=2;` means that x is now the value of 2. So typing `x+3;` will return the value 5;
`eqn:=x^2+5x+6 = 0;` means that `eqn` is now the equation $x^2 + 5x + 6 = 0$. So, typing `solve(eqn, x);` will solve the equation.
- To define a function $f(x)$, (read “f of x”) use the Maple syntax
`f:=(x)->function definition.` (Read this as “f is the function with variable x defined as follows”... or more simply “f of x”.)
 Since this syntax means $f(x)$, you can refer to it that way.
 Ex: `f:=(x)->x*sin(x);` defines the function $f(x) = x \sin x$.

$$f(\text{Pi}/2);$$
 will return the value $\frac{\pi}{2}$ since $f\left(\frac{\pi}{2}\right) = \frac{\pi}{2} \sin \frac{\pi}{2} = \frac{\pi}{2} \cdot 1 = \frac{\pi}{2}$

$$f(3a);$$
 will return $3a \sin(3a)$
 Note: If you need to refer to $f(x)$, you must refer to the entire “f of x” i.e. $f(x)$, not just f .
 Ex: For the f defined above:
`plot(f(x), x=-Pi..Pi);` will plot the function on the interval from $-\pi$ to π .
`plot(f, x=-Pi..Pi);` will return an error since Maple does not know what f is.
 Note: You do not have to always define expressions to be functions to use them later.
 Ex: `g:=2*x^3+1;` defines g to be this expression.
`plot(g, x=-3..3);` will plot g from -3 to 3 since Maple knows that g IS $2x^3+1$.
`plot(g(x), x=-3..3);` will give an error since Maple does not understand “g of x”.
- Use only parentheses for complicated, nested problems.
 Maple understands curly braces and square brackets to indicate lists – not as parentheses. For example, if you want Maple to evaluate $\sin(\pi x) \cdot \{1 - [2a + 3(a+b)^2]c + (a-b)^2\}$, type
`sin(Pi*x)*(1-(2*a+3*(a+b)^2)*c+(a-b)^2);`
 Error, “;” unexpected usually indicates not enough right parentheses.
 Error, “)” unexpected usually indicates not enough left parentheses.

Maple Survival Basics

Error, Unable to match delimiters means that the number of right and left parentheses do not match .

- Intervals are denoted by $a..b$.
If you want x values from -2 to 5 , type $x = -2..5$
If you want a values from $-\infty$ to zero, type $a = -infinity..0$
- Lists enclosed in curly braces $\{ \}$ are sets – order does not matter.
Lists enclosed in square brackets $[]$ are sequences – order does matter.
- Any time you open a previously saved worksheet, execute the entire worksheet before starting to work on it again. Otherwise Maple will not have any of your variable names and assignments saved in its memory. From the menu bar, click on Edit, then Execute \rightarrow Worksheet.
- Commands in Maple Worksheet Mode are typed in after the command line prompt $[>$.
To enter just text, click on the icon box with a **T** on the top menu bar. The prompt disappears and you can enter text.
To get a new command line prompt click on the icon box containing $[>$.
- Commands in Maple Document Mode can be typed anywhere, they do not need the command line prompt $[>$.

Below are some of the commands that are used often:

- The `restart`: command will clear any assigned values, variable names, etc.
It's a good idea to put this command at the beginning of each worksheet.
- Use the `plot` command, to plot functions of one variable. The syntax is
`plot(function, x = a..b);`
Ex: `plot(x, x=-3..3);` will plot the line $y = x$ on the interval $[-3,3]$
Ex: `plot(sin(x), x=0..2*Pi);` will plot the function $\sin(x)$ on $[0, 2\pi]$
Plot more than one function on the same graph by giving a list or set of functions:
`plot({x, sin(x)}, x=-2*Pi..2*Pi);`
`plot([x, x^2, x^3], x=-10..10);`
See the help page for many of the different options for a graph. For example, you can change the color and line thickness
- The `eval` and `subs` commands are helpful when you want to plug one value/expression into another expression. They often return the same output, but the syntax is different:
`eval(expression, variable=value)` or `subs(variable=value, expression)`
Think of the syntax for the `eval` command as “Evaluate expression at $x = \text{value}$ ”.
Ex: `f:=x^2+1;`
`eval(f, x=3);` will return the value 10. [Read this as “evaluate f at $x = 3$ ”].
Think of the syntax for the substitute command as “Substitute the value(s) into expression”.
Ex: `subs(x=3, f);` will return the value 10. [Read this as “substitute $x=3$ into f ”].

Maple Survival Basics

- Use the `evalf` command to force Maple to return the output as a decimal.
 $2/3+3/4$; will return the fraction $17/12$
`evalf(2/3+3/4)` will return the decimal 1.416666667

Saving Documents from the Citrix Server:

- The Citrix Server is cloud storage. Anything saved there will be “in the cloud” but not on your local computer.
- Unfortunately, the Citrix Server uses a similar folder naming system as your local computer (e.g., they both have something called the desktop), so it can get confusing. The good news is that if you save anything on the Citrix Server, it is on the cloud and will still be there when you log back in.
- If you want to save something to your local computer or a thumb drive, make sure you are doing it in the correct folder. If you are using a campus computer, look for a folder called Local Disk (C: on DA309Sxx) – the name will change for different computers and rooms. Click on this folder
▶ Users ▶ Your enumber and then navigate to where you would like to save the file.

Getting Help:

- Use the Maple Help Pages, which provide information about commands including syntax, description, and examples. The examples at the bottom of help pages are particularly helpful to check syntax. You may find it convenient to copy and paste an example into your own worksheet, execute it to verify that it works, and then edit it to your specific needs. The help pages can be accessed in two ways:
 1. Type `?command_name` to directly open the help page.
 2. Click on the Help Menu and select Topic Search. Type in the topic and double-click on the Matching Topic item to open the associated help page.
- *After* you have attempted to figure it out on your own, ask your instructor. Remember, you will be the instructor some day – so really try your best to figure it out yourself.