

## MAPLE Glossary for Lab 1

DO NOT HAND THIS SHEET IN WITH YOUR LAB. KEEP IT FOR THE NEXT SET OF LABS.

**Always bring a floppy disc to the lab and regularly save your work to your floppy.** When you save your work, save it with the .ms extension. Then when you re-open the file you will be able to execute all of the commands again. **If you save it as a text file, it will be unusable.**

Most beginning problems with MAPLE are due to misspelling the commands, or leaving out a parenthesis, or leaving out a semi-colon at the end of a command line. Remember that when you define an expression you need a colon. An example is  $f := x^2 + y^2$ . Without the colon MAPLE will not be able to work with your expression. You can save yourself work by copying commands you have already used and pasting them into your worksheet, then making the needed changes. The copy and paste commands work about the same way they do in EXCEL.

It's worth learning to use the browser to get more information about commands. Besides talking about the options available with a command, the browser also has many examples which you can copy and paste into your worksheet. To access the browser, pull down the help menu from the menu bar at the top of the screen, and select browser. This will open a window showing the areas in which help is available.

The Excel computer lab in 553 Lake is staffed with mentors who are familiar with the software and the mathematics in these computer labs. They are a good reason to do these labs in Lake Hall. If you get stuck, talk to a mentor. You really won't get anything out of staring at a machine that refuses to respond to you. We encourage you to explore MAPLE's different features. There is much more to MAPLE than we can put in this glossary!

### LAB 1 Commands

Here's a description of the commands you use in lab #1.

```
> with(plots);
```

This command loads the plots package into memory. Without it you won't be able to draw anything more complicated than the graph of a function of one variable. The "with" command has an argument, which is the name of the package you want to load. In MAPLE, arguments are always inside parentheses.

```
>for a from 1 by 2 to 7 do
```

```
>implicitplot(x^2/a^2 + y^2=1,x=-7..7,y=-7..7,
  scaling=constrained,axes=normal,grid=[100,100])
>od;
```

This set of commands sets up a do loop for plotting the set of points that satisfy  $x^2/a^2 + y^2 = 1$ . In the command “for a from 1 by 2 to 7 do”, you are defining  $a$  to be the index of the loop, giving it a starting value of 1 and telling MAPLE to increase  $a$  by 2 each time through the loop. When  $a$  is 7, MAPLE does its last loop. The “od” at the end tells MAPLE where the end of the loop is.

The command

```
>implicitplot(x^2/a^2 + y^2=1,x=-8..8,y=-8..8,
  scaling=constrained,axes=normal,grid=[100,100])
```

draws the implicitly defined curve  $x^2/a^2 + y^2 = 1$ . The terms  $x^2/a^2 + y^2 = 1, x = -8..8, y = -8..8, scaling = constrained, axes = normal, grid = [50, 50]$  are the arguments of the implicitplot command, and must go in the parenthesis. The first term is the equation that defines the curve, the next term gives the range of  $x$  and  $y$  values to be used in the plot, the next command tells MAPLE what scaling procedure to use, axes=normal specifies how you want the axes to appear (other possibilities are none, framed and boxed.) grid=[100,100] tells MAPLE how fine a picture you want to draw. With this command, MAPLE will evaluate the function  $x^2/a^2 + y^2$  at the 10,000 points located on a 100x100 rectangular grid, and use these function values to plot the curve. Notice that when this command is inside a do loop you don’t need a semicolon at the end.

```
>implicitplot({seq(x^2/(2*j-1)^2 + y^2= 1, j=1..4)},
  x=-8..8,y=-8..8,scaling=constrained,axes=normal,
  grid=[100,100]);
```

The seq command has a built in do loop; the counter here is  $j$  and it always increases by 1 each time through the loop. This means that if you only want  $a$  values which are odd, you have to use  $2 * j - 1$  in the expression instead of just  $j$ .

```
>implicitplot3d(2xy - z^2 + yz - x = 1,x=-3..3,y=-3..3, z=-3..3,
  axes=boxed, grid=[12,12,12]);
```

This command plots the graph of the equation  $2xy - z^2 + yz - x = 1$  in three dimensions, which is why you need to specify the range of  $x, y$  and  $z$ . Here the grid command creates a 12x12x12 grid which is used in crating the plot.

You will get sharper images when you print if you set the color to black and white in the plot window.

## Manipulating Plots and Windows

When MAPLE draws a picture you have the option of putting it into a separate window, or making it part of your worksheet. To change the setting, pull down the Options menu from the menu toolbar and select plot display. If you want to print only a single plot, use the Options menu to put your plots in separate windows, shift to the window that has the plot you want to print, then just go up to the file menu, and select print. At some of the labs there may be a lengthy printing backlog. In this case, you can go to the edit menu, select copy, then paste it into another program such as Microsoft Word, then print it from there. This is faster because of the way Word handles graphics; much less memory is used. If you have trouble accessing Word, ask a mentor.

You can change the size of your plot by using the mouse to position the cursor on the lower right corner of the plot. If you then hold the mouse button down and move the mouse, you can drag this corner to any position you desire; MAPLE will re-draw your plot to fit the new box. You can also rotate the plot to get a better viewpoint: click on it once so that a frame forms around it (this will also give various plotting options on the menu bar at the top of the screen); now dragging the plot in various directions will cause it to rotate.

While doing the labs you will want to switch between your different plot windows and your worksheet. The easiest way to do this is just to click on the window you want to look at. Sometimes when you have a lot of windows open it is hard to find the one you want. If you look at your screen, you will see towards the upper left hand corner a small drawing of a file drawer. This is a button for a pop-up menu. One of the options in this menu is “switch to” clicking on this option will give you a list of all active windows; if you click on the name of the window you want it will come to the front of the screen. If you have trouble finding the file drawer icon ask a mentor.

**Warning!** Maple manages its memory so that it uses the fast memory first, then it begins to use the hard drive for computational memory. This can result in delays when plotting. If, in the middle of your session, MAPLE seems to be taking longer to plot than at the beginning, save your work to your floppy, exit Maple, then open your worksheet again. Remember to save your worksheet as an ms file, not as a text file. When you re-open your worksheet, think about where you are in the lab. You don't have to execute every command in the lab again, but only execute the commands before your stopping point that you need to finish the lab.