The version of Maple you'll be using is Maple 11; this sheet was developed for Maple 10, but don't think there have been major changes.

If you choose to download Maple onto your computer, you have some choices on how to set it up – go to Maple 11-Preferences (mac) or Tools-Options (pc) to choose whether you're working in worksheet mode or document mode, and also to choose whether as you type the input gets converted straightaway to mathematical notation or looks just the same as how you type it. You change the mode by going to the interface tab; you change the input display by going to the display tab.

To make your Maple experience more pleasant, keep in mind:

1. At first it seems like it's taking a while to learn Maple, but if you're patient, it begins to all fit together and seem like a great program.
2. Maple has a web site with Maple tutorials. Whether you've never used Maple before, or have but feel shaky with it, or really enjoy Maple and want to know more, these tutorials might be a good place for you to go. I have a link to the site on my Calc 2 web page; follow the directions given there.
3. When you open Maple, it will present you with a new file in document mode. You can experiment with that (I will be), or you can go to *File - New - worksheet.*

   When you're working with a worksheet, there are two types of input – mathematical commands and text. Unless you choose to enter text, you'll be entering mathematical commands.

   To execute your commands, you need to end each command with a semi-colon or a colon, then hit *return.*. A semi-colon displays the result, a colon suppresses the result.
4. Occasionally in Calc 2, you'll need to load the student package. This loads extra commands, which allow you to, among other things, graph rectangular approximations to curves. To load this package, enter
   `with(student)`
5. Maple is case-sensitive: `plot` is **not** the same as `Plot` !
6. Maple is also a little strange about multiplication. It's best to include the `*` for multiplication, like `3*(x+y)` for $3(x+y)$.
7. There's a vertical column of buttons on the left that each open up palettes to choose from. I haven't explored these much yet, but it looks like if you're willing to explore them, you'll find a lot of shortcuts.
8. *Important:* Always check the output and make sure that Maple has executed your command in the way you expected before you move on to the next calculation. Often people didn't have parentheses where they were needed, and don't even realize that they've made a mistake. Other times, they've made an error and don't know it because they didn't read the output.

   If you do make an error, spend a few seconds reading the error message – often you can figure out what you did wrong.
9. Don't be afraid to explore! And remember, the online Help (available in the **Help** menu) is your friend!

On the next couple pages are some of the commands we'll use, very roughly organized by type. Feel free to add your own favorites on the back as the semester goes on.

Command	Description
CONSTANTS:	
`Pi`	The constant π
`exp(1)`	The constant e
`sqrt(5)`	$\sqrt{5}$
`cos(Pi/4)`	$\cos(\pi/4)$
COMMON FUNCTIONS:	
`exp(x)`	The natural exponential e^x. For example, to get e^2, you would enter `exp(2)`.
`sqrt(45+sin(x))`	The expression $\sqrt{45+\sin(x)}$.
DEFINING FUNCTIONS AND ASSIGNING VALUES:	
`w := x^2 + 3*x`	Assigns w to be the *expression* x^2+3x. From that point on, whenever you use w, Maple will substitute x^2+3x.
`w:='w'`	Unassigns w. Now, w is just w.
`f := x -> x^3 + sin(x)`	Defines a *function* of one variable $f(x)=x^3+\sin(x)$.
`f := (x,y) -> 3*x^2 + 2*x*y`	Defines a function of *two* variables
`L:=[ [1,10], [2,5], [4,2]]`	Defines a list of points
`A:=matrix[ [2,3], [4,5] ]`	Defines a 2 x 2 matrix with top row consisting of 2 and 3, second row consisting of 4 and 5
`restart`	Clears all definitions and reinitializes Maple.
VARIOUS USEFUL COMMANDS:	
`evalf(3*sqrt(Pi) )`	Returns a decimal approximation of $3\sqrt{\pi}$ using 10 significant digits. evalf stands for "evaluate to floating point".
`evalf(3*sqrt(Pi), 20)`	Returns a decimal approximation using 20 significant digits.
`%`	The output from the last executed statement.
`simplify( sin(x)^2 + cos(x)^2 )`	Simplifies the expression. In this case, the result is 1.
`solve(x^2+3*x+1)`	Solves the equation $x^2+3x+1=0$.
`solve(t*x^2+3*x*t+1, t)`	Solves the equation $tx^2+3xt+1=0$ for t.
GRAPHING:	
`plot(sin(x)+Pi/2, x=-2..Pi, color=blue)`	Generates a plot of $y=\sin(x)+\pi/2$ from $x=-2$ to $x=\pi$ in blue. You can leave out the color if you want.
`plot( [x^2, cos(x)], x=0..2*Pi, color=[blue,red])`	Plots the two functions $y=x^2$ and $y=\cos(x)$ on the same set of axes. The color is useful for distinguishing the plots.
`plot(L, x=0..5)`	If you have defined L to a list of points (see above) whose x coordinates are all between 0 and 5, this command will plot these points and draw lines connecting them.

Command	Description
Calculus Commands:	

`Diff(x^3+sin(x), x)`
 	
`value(%)`
	Returns the expression $\frac{\partial}{\partial x}(x^3+\sin(x))$. This allows you to check whether you've entered everything correctly.
	
	If you follow the command `Diff(x^3+sin(x),x)` immediately with this one, it will return the derivative of $x^3+\sin(x)$ with respect to x.

`diff( x^3 + sin(x), x)`	Returns the derivative of $x^3+\sin(x)$ with respect to x, $3x^2+\cos(x)$. Once you feel comfortable both with Maple and with differentiation, you can use this command rather than the previous one.
`diff(f(x),x)`	Returns the derivative of a function you have already entered, see top of page 2.
`diff(x^{3}+sin(x),x$2)`	Returns the second derivative of $x^3+\sin(x)$ with respect to x, $6x-\sin(x)$. You can also do second derivatives as above, where the expression is returned first, by simply capitalizing the "d" in `diff`.

`Int(x^3+sin(x),x)`
 	
`value(%)`
	Returns the expression $\int x^3+\sin(x)\,dx$.
	
	If you follow the above command with this one, Maple will return the indefinite integral (i.e. the antiderivative) of $x^3+\sin(x)$.

`int( x^3 + sin(x), x)`	Returns the indefinite integral, or antiderivative, of $x^3+\sin(x)$, $\frac{1}{4}x^4-\cos(x)$.
`int(f(x),x)`	Returns the antiderivative (indefinite integral) of a function you've already entered (see top of page 2).
`int(x^{3}+sin(x),x=2..5)`	Returns the definite integral of $x^3+\sin(x)$ from 2 to 5. If you capitalize the "i" in "into", it will return the expression $\int_2^5 x^3+\sin(x)\,dx$. To get the value, you would then enter `value(%)`.
`Sum( j^2, j=1..300)`	This creates the sum $\sum_{j=1}^{300} j^2$, but does not evaluate it. You'll need to use `value(%)` to get a numeric value.
`sum(j^{2}, j=1..300)`	This returns the value of the sum directly.

Command	Description

Calculus Graphing Commands:

`with(student)`	Loads the student package. You must load this package before you can use `leftsum( )`, `leftbox( )` and related commands.
`leftsum(x^2, x=0..3, 10)`	Generates the leftsum approximation of $\int_0^3 x^2\ dx$ using 10 equal subintervals. You need to use `evalf( )` to get the decimal approximation. There are also `rightsum( )`, `middlesum( )`, and `trapezoid( )` commands.
`leftbox(x^2, x=0..3, 10)`	Draws the diagram associated with the left sum. There is also a `rightbox( )` command.
`with(plots)`	Loads the plots package. You must load this package before you can use `tubeplot()` command.
`tubeplot( [x, 0, 0], x=0..4*Pi, radius =sin(x)+ 2)`	This will draw the surface obtained by rotating the graph of $y = \sin(x) + 2$ about the x-axis from $x = 0$ to $x = 4\pi$. For all of our plots, you should not change the `[x,0,0]` part of the command.