

## 1 Some very basic Maple usage

First off, I don't know Maple nearly as well as Mathematica. But this is just – as you see above – very basic usage.

### 1.1 End lines with a semicolon, then hit enter.

Somewhat nicer than Mathematica, you can just use semicolons and hit enter to get Maple to evaluate your input.

```
> sin(pi/2);
```

One exception is getting help. Using a question mark and the name of a function pops up some help on that function. Of course, that's not terribly helpful if you don't know the name of the function in the first place:

```
> ?sin
```

I don't know of a introduction to Maple that's similar to Jon Rogness' Lab 1A for Mathematica. Please email me suggestions if you know of one (drake@math.umn.edu)

### 1.2 Lowercase letters. Parentheses.

Maple is sortof the anti-Mathematica in this respect.

```
> factor(x^2 + 2*x*y + y^2);
> simplify(HermiteH(3,x));
```

### 1.3 Defining your own functions

Of course, this has to be totally different from Mathematica. Always use := for assignment:

```
> a := 12;

> b := x*y;

> stegasaurus := plot(sin(t)*cos(t), t=0..Pi);
```

Defining a function is sortof weird if you're familiar with Mathematica or C/C++/Java syntax:

```
> f := (x,y,z) -> x + y + z + Pi;

> asms := n -> product((3*j+1)!/(n+j)!, j=0..n-1);
```

Maple has two commands for product: the one above, and "mul". The "mul" command is treated in a less sophisticated way: Maple really just multiplies all the values together. Apparently "product" tries to apply basic transformations to see if the given function reduces to something known. I'm not entirely clear on the distinction.

## 1.4 Recursive functions

The Recursive Function Pedagogy Police will undoubtedly arrest me if I don't start with factorials:

```
> zoog := n -> n * zoog(n-1); zoog(0) := 1; zoog(1) := 1;
```

Note I've put several commands on a single line. The semicolons make it unambiguous that I have three commands in mind. If you want linebreaks, you can hit Shift-Enter. The meanings of "Enter" and "Shift-Enter" are precisely switched between Mathematica and Maple.

```
> zoog(6);
```

Let's also do orthogonal polynomials.

```
> p := (n,x) -> (x-b(n-1))*p(n-1,x) + l(n-1)*p(n-2,x); p(0,x) :=
1;
> p(-1,x) := 0;
```

As long as you define your base cases, everything will work fine. Note that if you ask for, say  $p(1.5, x)$ , it will complain because it never hits a base case.

As in Mathematica, if we define the  $b$  and  $l$  functions, we'll get a particular sequence of polynomials. Until then, Maple just says "b(5)", etc, because it doesn't know what that is.

## 1.5 Other useful functions

factor, expand, and simplify are basically the same as in Mathematica, but I'm not aware of a version of the "//" notation. Also collect and expand:

```
> collect(expand(JacobiP(3,a,b,x)),a);
```

We also have the series function. Its parameters are: thing to be expanded, x=expand\_about\_this\_point, order.

```
> series((1-sqrt(1-4*x))/(2*x), x=0, 8);
```

Everybody loves coefficients.

```
> 5!*coeff(series(exp(x*t+t^2/2),t=0,6),t^5);
```

Note that Maple expands a series to one less than the given order; in the above series, the last term is "O(t^6)" when we say "to order 6". In Mathematica, it would find the first 6 coefficients and say "O(t^7)" for the rest.

Instead of Table, we can use "seq" which generates a sequence. There's a "table" function in Maple but I think it works a bit differently. seq does what we want, though:

```
> hermitematching := (n,x) ->  
> sum('binomial(n,2*k)*doublefactorial(2*k-1)*x^(n-2*k)', 'k'=0..floor(n/  
> 2));  
> hermitematching2 := (n,x) -> 2^(-n/2)*HermiteH(n,x*sqrt(-1/2));
```

Let's see if these polynomials still match up:

```
> seq(simplify(hermitematching(n,x)/hermitematching2(n,x)),n=0..10);
```

## 1.6 Making notes to yourself

While in a cell, hit Ctrl-T to turn it into text. When you want to go back to a math cell, hit Ctrl-M. There's also buttons at the top you can use: the "T" for text, and "[ >" for math input.

Insert -> Section, Subsection make these nifty collapsible sections.

## 1.7 Jane, stop this crazy thing (dealing with the Maple kernel)

You can reset all your variables and definitions with the command restart:

```
> restart;
```

If you want to stop Maple's evaluation, hit the button on the toolbar marked with a stop sign. That's probably the most intuitive button on the toolbar.

There's also "unassign" which corresponds to Mathematica's Clear:

```
> a := Pi/2;
```

```
> unassign(a);
```

Oops, it evaluated "a". Use single quotes to prevent Maple from turning a into Pi/2:

```
> unassign('a');
```

The value of a has been forgotten:

```
> a;
```

The analogue of Delete All Output is in the Edit menu: Edit -> Remove Output. You can select some cells and remove the output from that, or do the whole worksheet.

## 1.8 Getting help

To look up a certain topic or function, use Help -> Topic Search (or Full Text Search). The help browser isn't very good; you can't look up another function without going through the menus again. It also doesn't respect any window resizing if you minimize the window and bring it back up. It's generally pretty easy to figure out how the syntax works, though.

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