Math 235: Calculus Lab

Prof. Doug Hundley

Whitman College

Week 3

Introduction to Maple

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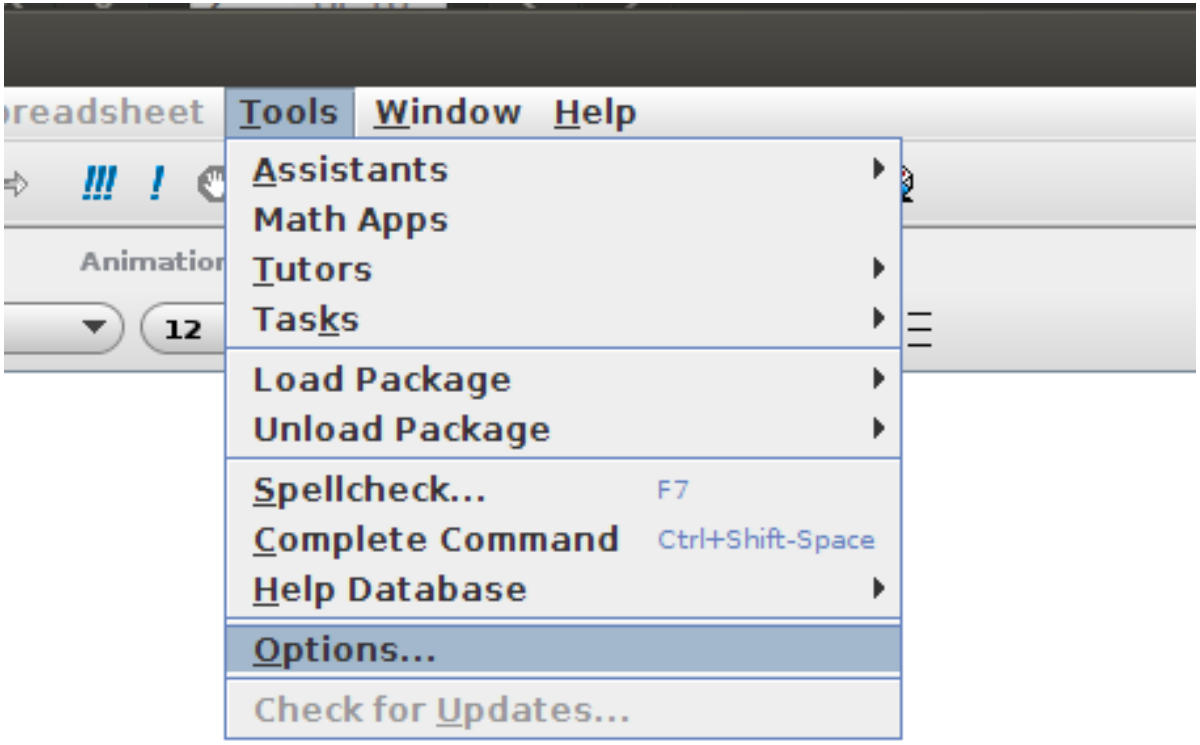
To put Maple on your own machine

- The college has a license to run 50 copies at once, so you can use it on your home machine (unless we run into a shortage of copies).
- Go to the following website:

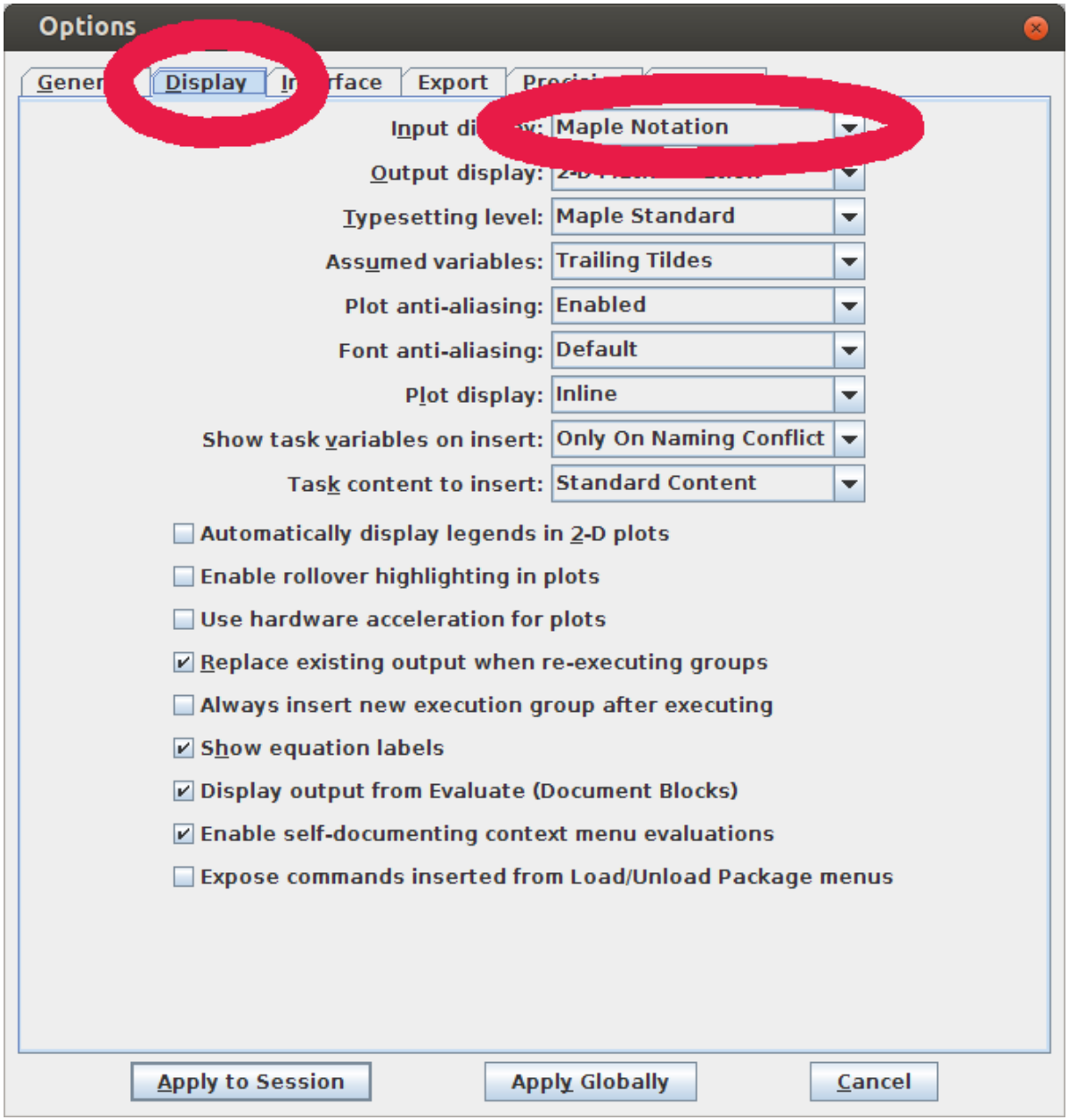
  `http://math.whitman.edu/Maple-16/`
- Read the `README` file carefully!! It has all the instructions you need.
- If you open Maple and it asks you to put in a passcode, you've installed it incorrectly!

Setting up Maple

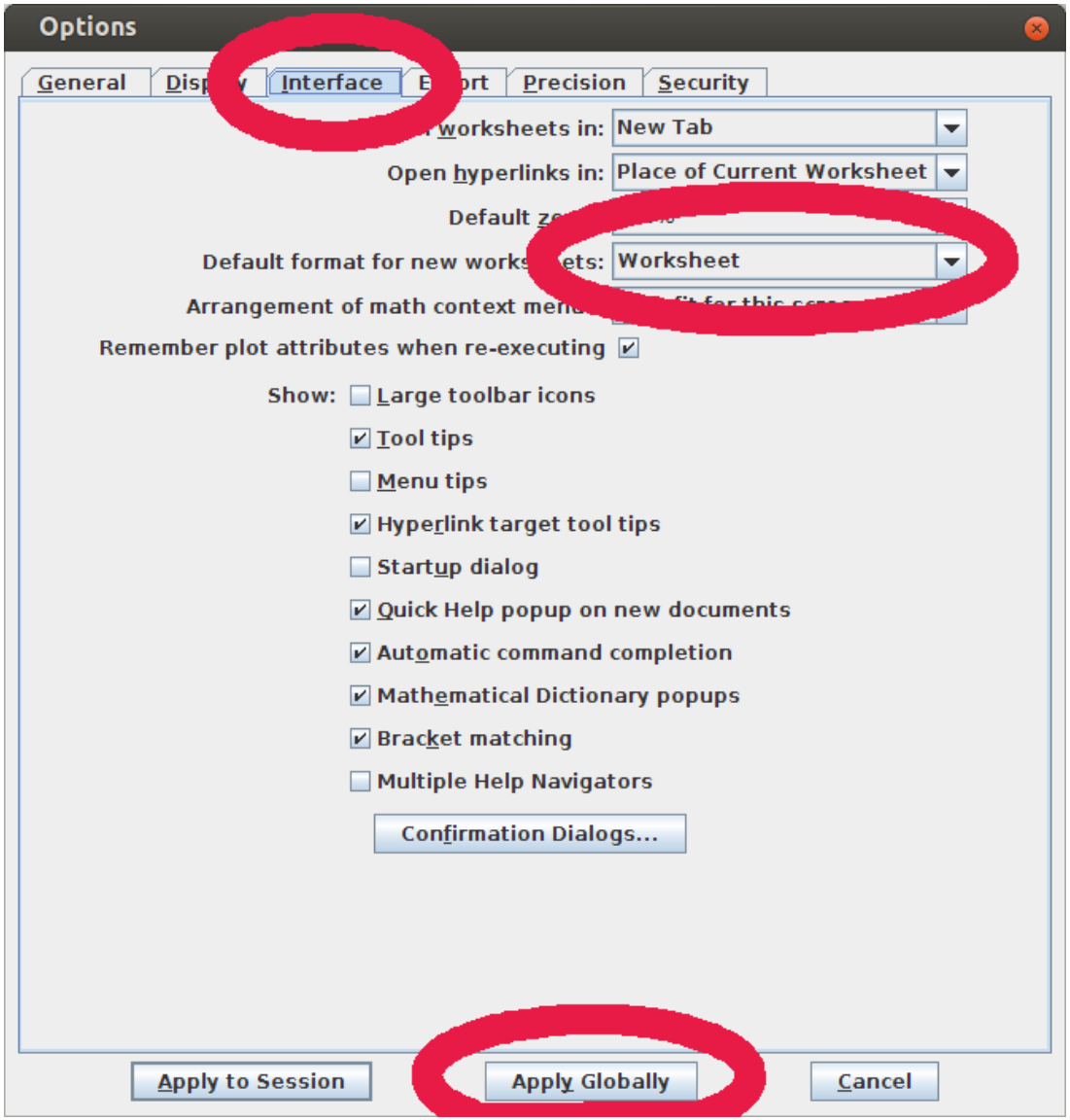
Go to TOOLS, then OPTIONS



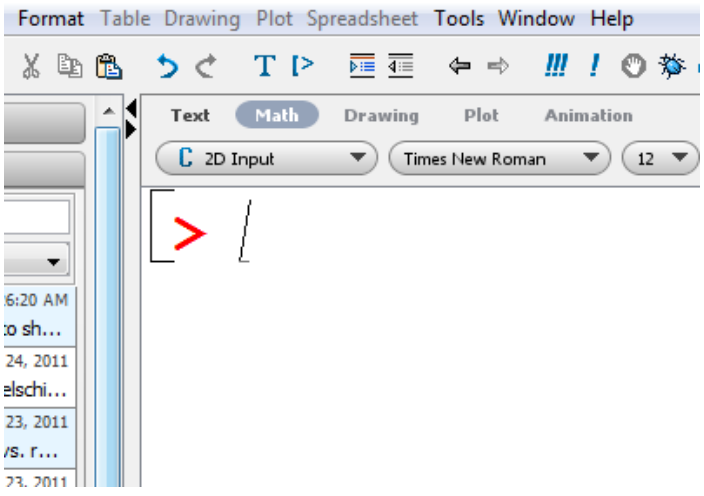
Go to DISPLAY, then
change INPUT DISPLAY to MAPLE NOTATION:

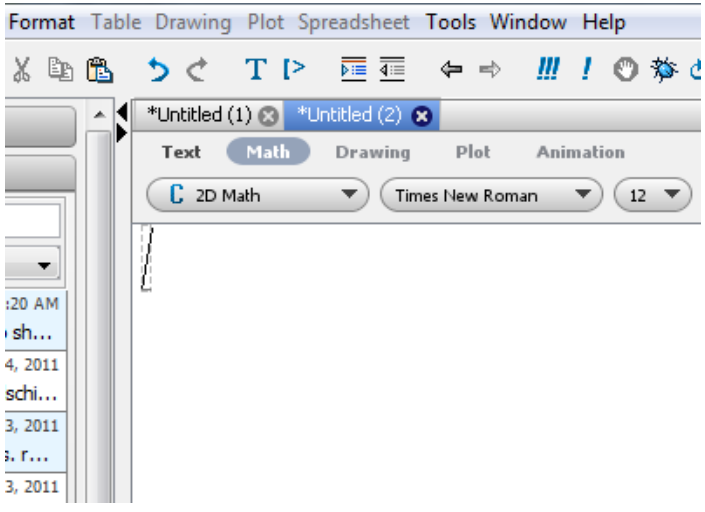


Go to INTERFACE, then
change "Default format for new worksheets" to WORKSHEET
select APPLY GLOBALLY



Take a moment to close/re-open Maple for a check:
You should have a red prompt (like image to the left), the image to the right is incorrect (Document style).





Computations in Maple

Standard operators, with `*`, `^`, and `exp()` for multiplication, exponentiation, and the exponential function.
Examples (See the tutorial):

```
2/5;
2^5;
exp(2);          # This is e^2
(1+3*I)*(1-I);  # Complex Numbers
ifactor(60);
evalf(Pi);
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```

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  What happens: `6:=a`
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  Solve $E = mc^2$ for the variable m:

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  Solve $E = mc^2$ for the variable m: `solve(G,m);`
- Expand expression stored in F: `expand(F);`
- Clear the variables F and G:
  `F:='F';  G:='G'`

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f:=a*(x+3)^2;
subs({a=3,x=1},f);
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Example: If $x = z^2$, substitute in f, store the result in f2:

```
f2:=subs(x=z^2,f);
```

Check what the variables are: `f, a, x, f2`

Functions versus Assignments

Functions take inputs and create outputs. Assignments store expressions in variables. Here's an example of the difference:

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f:=x^2-3*x+5;
f(1);              #Maple will not understand this
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g(1);
(g(x+h)-g(x))/h;
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g(1);
(g(x+h)-g(x))/h;
```

How to make a function from an expression: `unapply`

```
h:=unapply(f,x);
h(3);
```

Some commands will only operate on *functions*, some only work with *expressions*, some will work with both, but how you call the operation may change.
Clear out the workspace, and we'll do create some plots.

```
restart;
f:=x^2+4*x-2;     #f is an expression
g:=x->sin(x)+x;   #g is a function
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plot(f,x=-8..8);     #This is OK
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plot(g(x),x=-8..8); #This is OK
plot(g, -8..8);      #This is OK
plot(f, -8..8);      #This is an error
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Hint: Always use one form or the other (Probably easier to use the expression).

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plot({f,g(x)},x=-8..8,y=-5..8);
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You can plot *parametric equations*!

```
plot([sin(t),cos(3*t),t=0..2*Pi]);  #Brackets include t
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You can plot *parametric equations*!

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plot([sin(t),cos(3*t),t=0..2*Pi]);  #Brackets include t
```
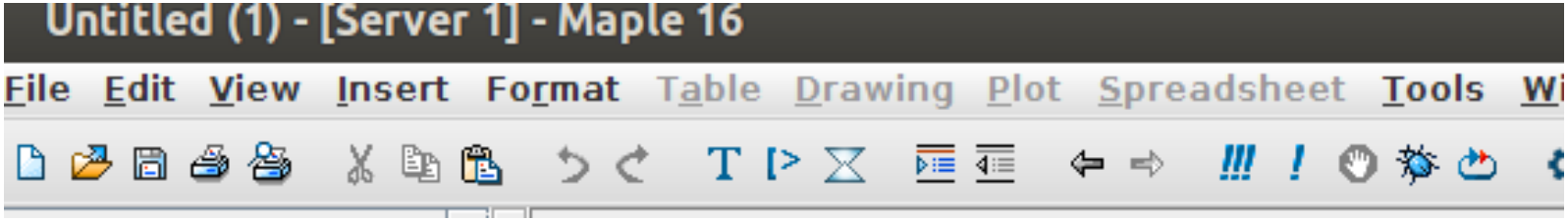

You can plot in polar coordinates as well!

```
plot([sin(t),cos(3*t),t=0..2*Pi],coords=polar);
```

Buttons on the top toolbar

Some of the important buttons:



- The usual copy/paste keys.
- `T` is for text. Go to a prompt, and insert some text.
- To get a new "execution group", use the `[>` key...
  Or: `Insert->Execution Group`
- The stop sign: Try to stop the computation.
- A debugger (we won't typically use this)
- Restart

- Note on turning Maple Worksheets in:
  - Go to `Edit->Remove Output->From Worksheet`
  - Save the worksheet.
  - Exit Maple.
  - Open Maple back up, and find the worksheet.
  - To execute all commands, use the !!! button.

Sources for help and more information:

- Go to: `Tools`, then *Assistants*, *Tutors* or *Tasks*
  Helpful: Take some time to browse through these!
- Help on a certain command: `?command` (like `?plot`)
- General help: There is a lot of stuff on the web, and a lot is accessible from the *Help* option at the top of the page.

Homework:

1. Finish working through the introduction.
2. Use the introduction and help files to answer the Maple questions on the class website.
3. DUE: for Wed Section- Feb 13 (next Thursday). For Fri Section- Feb 15 (next Sat).
4. Discuss text and execution groups...