Plots

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Overview

The main objective in this lab is to learn to use the Maple 9.5 to produce nice graphs of functions.

Maple Essentials

- Important Maple commands introduced in this lab are:

Command	Description	Example
:=	assignment	f:=abs(x)/sqrt(x)+2*x^2+exp(1-x^2);
plot	plot one or more expressions	plot([f,x^3],x=1..2,color=[red,blue],style=[point,line]);

- The *Plot Builder* maplet is started from the Maple 9.5 user interface under the **Tools** menu:

$$\textbf{Tools} \rightarrow \textbf{Assistants} \rightarrow \textbf{Plot Builder ...}$$

Related course material

To help determine an appropriate viewing window for graphing, read Examples 3–5 (pages 18–21) in §1.2 of the textbook.

Activities

- Login and start a Maple session.
- Launch the *Plot Builder* maplet. *This is an intuitive interface for creating simple plots.*
    - Generate a single plot with graphs of $y = \sqrt{x}$, and $y = |x|$ for $-2 \le x \le 2$. (Click `Add`, type `sqrt(x),abs(x)`, click `Accept`, click `Done`, click `2-D plot`, change x-range to `-2` and `2`, click `Plot`).
    - Generate the same plot as before, but before clicking `Plot`, click `Options`. (Once you click `Plot` you cannot return to the `Options` window.) First, give your plot a *title*. For each of the two functions, select the function at the top left of the `PlotBuilder` window and change some of its features. The options under `Color` distinguish curves well on the computer screen and on color printers. The options under `Line` are more effective at distinguishing curves printed on a black-and-white printer. When you are ready to see the graph, click `Plot`.
    - Right-click on your graph to see the context menu. Under the option `Legend`, click `Show Legend`. Now, from the same context menu, click `Edit Legend`. Enter an appropriate label for the first curve. Repeat this step for the other curve in the plot.
    - For some Maple projects it will be useful to copy your final plot to a Word document. See if you are able to do this now.
- Use `Plot` command to produce graphs. *While the* Plot Builder *is intuitive to use, you have to start all over again if you want to make any changes. It is often easier and more flexible to use maple commands directly to do the plot.*
    - Define a function `f` of your choice using `:=`. (Don't forget to type `;` at the end before pressing `Enter`.)

- – The general call sequence for the `plot` is `plot(f,h,v,options)`, where f = function(s) to be plotted, h = horizontal range, v = (optional) vertical range, options = other options (see examples and help menu). A typical call to the plot function is `plot(f, x=a..b);` (=a..b optional), where f is a real function in x and a..b specifies the horizontal real range on which f is plotted. The Maple 9,5 will automatically determine the vertical range to fill the plot to the view window if no y-range is given. If no x-range is specified, -10..10 is used for the horizontal range.
  - – Examples: `plot(f,x);`
    `plot(sin(x),x=-2*Pi..2*Pi);`
    `plot(sin(t),t=-2*Pi..2*Pi,y=0..1);`
    `plot(sin(x),x=-Pi..Pi,'text');`
    `plot(sin);`
    `plot([f, x^3 ], x=1..2, color=[red,blue], style=[point,line]);`
  - – For more details about `plot`, check the help menu in the Maple 9.5:
    help→introduction→graphics→2-D→plot.
  - – For more details about other options, check the help menu in the Maple 9.5:
    help→introduction→graphics→2-D→Options.
- • Choosing a viewing window. *The following example shows that choices of viewing ranges can greatly affect one's perception of how a graph looks.*
  - – Plot the same function $y = x^3 - x$ using the following different x-ranges: $-0.1 \leq x \leq 0.1$; $-1 \leq x \leq 1$; $-10 \leq x \leq 10$; $-2 \leq x \leq 2$.
  - – Explain mathematically for the graphs you got.
- • If you have time left, work on some examples/exercises in §1.2 or some homework problems that involve graphs.
- • Save anything you want to save and remember to logout.

Assignment

Use maple to work out Exercises 8, 9, and 10 in §1.2 (page 25). Your TA will tell you how assignments will be counted for your lab grade.