Lab 1: Parametric Curves and Maple

Objectives:

- Finish the Maple questions (so they will become part of Lab 1).

- Write up to a page or two of mathematics. The topic will be: Parametric curves.

- Learn to use Maple to plot parametric curves.

Maple help pages that will come in handy:

?plot,parametric, ?spacecurve, and ?textplot

Sample Maple Examples

Here are some sample Maple sessions that may help you in your write up.

1. Plot the unit circle as a set of parametric functions, and insert some text into the plot.
   SOLUTION:

   ```
   with(plots):
   A:=plot([cos(t),sin(t),t=0..2*Pi]):
   B:=textplot([1/sqrt(2), 1/sqrt(2), "Here is text"], align={ABOVE, RIGHT}):
   display({A,B});
   ```

2. Plot a helix as a set of parametric functions in three dimensions. Plot two helixes together.

   ```
   with(plots):
   spacecurve([cos(t),t,sin(t),t=0..2*Pi]);
   spacecurve({[t,6*cos(t),2*sin(t),t=0..6*Pi],
           [5*cos(t),3*sin(t),t,t=0..6*Pi,numpoints=10,color=black]});
   ```

   NOTE: The line break is for readability, don't break the line in Maple.

   Try changing the "number of points" until the curve is smooth.

Lab 1

The topic for Lab 1: What are parametric functions, and how do the concepts of the derivative and tangent line change from what we know in Calculus I for functions of the form $y = f(x)$?

Your writeup should be no longer than about a page of discussion (you might have about a page worth of figures).

Lab 1 Grading:

At the end of reading your work, the reader should understand what a parametric function is (in 2 and 3 dimensions), and how the tangent line in Calculus I extends to a line in two and three dimensions. You may assume that the reader knows Calculus I, and has some experience working in two and three dimensions (so you don't need to introduce the coordinate system).

Here are some specific things I'll look for:

- Maple material is accurate and complete. You were able to incorporate the Maple commands and figures into your document.

- For the new material:

  - Overall organization
    The write up should have a beginning, a middle and an ending. Use sections

    `\section*{}, \subsection*{}, \subsubsection*{}`

    (The asterisk removes LaTeX's numbering, and looks nicer for very short documents).

  - Include some definitions and graphs (see the sample write up). In your LaTeX file, you should include some numbered equations and reference them (and reference the figures).
    For an example of each of these items, refer to the sample documents on our class website.

  - The mathematics is correct (and you've done at least one or two non-trivial examples).

  - The mathematics is typeset correctly.

  - Figures are used to illustrate your points.

  - Spelling and grammar.

- What to turn in?
  You should upload the PDF and latex versions of your files to your CLEo dropbox. Please include the name of the person you're working with in your LaTeX document (OK to include it as a comment at the top of the page).

- **Due: February 17** (This is the Friday before the three-day weekend, so be sure to plan ahead!