Math 291:01 | **Maple lab #2** | **10/16/2006**

A web page which can help you with this assignment will be linked to the course web page. You are encouraged to discuss this assignment with other students and with the instructors, but the work you hand in should be your own.

Every student has been assigned a specific vector function on a webpage. The components of the vector function will be various combinations of sine and cosine, perhaps raised to (integer) powers. This could be the theoretical description of the "backbone" of a large molecule. This `Maple` lab asks you to investigate and report on the molecule. In order to help you check preliminary results, the message will also contain the curvature of the curve when the parameter, t, is 2. You will analyze your own curve and answer these questions:

> How big is the curve? How long is the curve? Does the curve intersect itself? What is the largest curvature that this curve has? At what point does this largest curvature occur? Show this on a graph.

The following comments may be distressing or irritating to some of you:

> Precise computations of the quantities requested are almost always impossible. Therefore you'll need to use numerical techniques, or you'll need to estimate by examining graphs. Your results will be approximations. This is good enough!*

This assignment is due **Monday, October 30**.

Please hand in the following material:

0. All pages should be labeled with your name and section number. Also, please *staple* together all the pages you hand in.
1. A printout of all `Maple` instructions you have used. (Yes, you may and should "clean up" by removing the instructions that had errors.)
2. Identify a graph of the curve clearly in your printout. If you need to, show several graphs of the curve which will help convince the reader that your curve does or does not have several self-intersections.
3. Give several graphs of the curve which allow you to identify a "box" in which the curve sits. The box should be of the form $x_{\min} \le x \le x_{\max}$, $y_{\min} \le y \le y_{\max}$, and $z_{\min} \le z \le z_{\max}$. You can indicate the dimensions "by hand" on your printout.
4. Compute the length of your curve.
5. Compute the curvature of the curve when $t = 2$. Show that this matches the information you were given. Graph the curvature of your curve as a function of the parameter, t. Indicate "by hand" on this graph the value of the parameter and the value of the curvature for the point on the curve which has the largest curvature.
6. Compute the coordinates of the point on the curve which has the largest curvature. Identify this point with the greatest curvature on a graph of your curve. You may wish to show both a constrained and an unconstrained view.

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* Although they are approximations, I realistically can't imagine getting even moderately accurate approximate answers for these questions in a reasonable amount of time without technology (a machine and programs).