

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.

A webpage will be posted listing individual data for each student. The data for this lab will be a vector-valued function. 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 assignment is due **Thursday, October 8th**.

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. Also included should be a printout of all Maple commands you have used. Yes, you may and should “clean up” by removing the commands that had errors. You do not need to print out this page, or the background information page.
1. Identify a graph of the curve clearly in your printout, and determine if it has any self intersections. 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.
2. Give several graphs (.i.e at least one additional graph) of the curve which allow you to identify a “box” in which the curve sits. The box should be of the form $x_{\min} \leq x \leq x_{\max}$, $y_{\min} \leq y \leq y_{\max}$, and $z_{\min} \leq z \leq z_{\max}$. You can indicate the dimensions “by hand” on your printout.
3. Compute the length of your curve.
4. Compute the curvature of the curve when $t = 2$. Show that this matches the information you were given.
5. 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.