

For the second project, your assignment is to do parts 1 to 5 of the Laboratory project on Bézier curves on page 237 and 238 of Stewart. This project will be due on 13 November 1998.

You are to work in groups of 2 to 5, again. Please write the names and section numbers of each person in your group on the cover sheet of your project. Also write the statement "Each person in this group made a substantial contribution to the completion of this project." and have each group member sign.

If you wish to work with someone in a different section, please make arrangements with your TA. Each group should hand in a 2-7 page report describing what you have done and answering each of the questions in Stewart's text. You do not need to type or word-process your report. Typing mathematics is extremely difficult: your time is better spent learning mathematics.

Your answers to 1,3,4 and 5 should be illustrated by sketches which you have copied from your calculator screen. Please label these sketches and give the control points so that I can check your work, if necessary.

The best answers to parts 4 and 5 will indicate how you use the conclusion to part 2 to speed up the process of guessing good control points.

Plotting Bezier curves efficiently. You will find the entering the Bezier curve into your calculator is very time consuming. Since the project involves a bit of experimentation, you will want to be able to do this as efficiently as possible. One way to do this is to enter the functions on the bottom of p. 237 into your calculator with letters standing for each of the control points. For example, let $(x_0, y_0) = (A, B)$, $(x_1, y_1) = (C, D)$, $(x_2, y_2) = (E, F)$ and $(x_3, y_3) = (G, H)$. Then, you may enter the coordinates using the "STO" key: If you press 5, STO and then A, then the following will appear on your screen.

$$5 \rightarrow A$$

Pressing enter will then assign the value 5 to the variable A.

This way, you can change the control points without reentering the entire formulas for $x(t)$ and $y(t)$.

Plotting line segments. The parametric curve for the line segment

joining (x_j, y_j) and (x_{j+1}, y_{j+1}) is

$$\begin{aligned}x(t) &= x_j \cdot (1 - t) + x_{j+1}t \\y(t) &= y_j \cdot (1 - t) + y_{j+1}t.\end{aligned}$$

Again, you can use the same letters for the coordinates of the control points as in the parametric equations for the Bezier curve and save yourself the trouble of re-entering the line segments when you change the control points.

October 30, 1998