

Calculus Lab 1: Parametric Curves and Arc Length

Due Date: September 18 at the beginning of class

The purpose of this lab is to further familiarize you with LaTeX, start working on some mathematics, and write your first technical report. This lab, together with our previous homework, will be 15% of the overall grade.

A curve is defined by:

$$x = \int_1^t \frac{\cos(u)}{u} du \quad y = \int_1^t \frac{\sin(u)}{u} du$$

Find the length of the arc of the curve from the origin to the nearest point where there is a vertical tangent line. Write a complete solution to this problem.

Here are some guidelines I will use to grade your work:

- (1) The problem is clearly stated.
- (2) The mathematical techniques and formulas used to solve the problem are clearly stated.
- (3) The conclusions are clearly stated.
- (4) Correct labeling and referencing of equations.
- (5) Correct use of mathematically precise language.
- (6) Does the group go beyond the original problem to discuss related problems? This is a measure of the overall quality of the paper. I would like for you to really think about the problem, and what you need to do to solve it.

Here are some hints:

- (1) Your audience is a Calculus student. They may or may not remember any formulas, but they would be familiar with the basic ideas of Calculus.
- (2) Before doing any typing, you should already have the solution in detail. Make notes of any special formulas or ideas that were used. When you are ready to type, use our first homework file as a template.
- (3) Do not turn in a list of formulas! I want to see use of language! Think about the language you would use if you were to present your solution to another person.
- (4) Use sections to highlight transitions. In the Introduction, write about the problem you are going to solve. You might discuss the general context before stating the specific problem. You might use a section called Methods to discuss what formulas and ideas you had to use. Be sure to end your paper with Conclusions- in this section, you might also discuss related problems.
- (5) Look at your Calculus book if you need mathematical assistance, and to see how mathematics should be typeset. This problem is similar to what you have looked at in Chapter 10 of Stewart's Calculus.
- (6) Each group should work on their own, and each group will turn in one hardcopy version.
- (7) I'm not looking for humor or brilliant exposition- I'm looking for a solid, logical argument with supporting facts¹. Your report should take the reader through an exploration with a beginning, a middle, and an end.

¹You may use footnotes to reference any outside source you use.