Due Date: Tuesday, December 6 at 5PM EDT

Carefully read and provide solutions to the problems below, showing all work required to justify any conclusions you make. You are encouraged to collaborate with your classmates, but all solutions turned in should be your own work. If you do collaborate, please record the names of those other students on your submitted work. Finally, your work should be submitted as a PDF on Canvas before the listed due date.

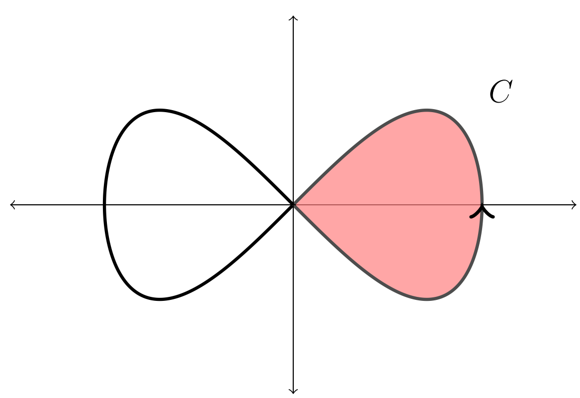
Textbook problems: Section 13.1 #42; Section 13.2 #26; Section 13.3 #8; Section 16.1 #34; Section 16.2 #12, 22; Section 16.3 #8, 14; Section 16.4 #8, 18; Section 16.5 #6

Optional textbook problems: the odd numbered problems from Sections 13.1 - 13.3 and 16.1 - 16.6

Problem 1. Let R be a region in the xy-plane bounded by a simple, closed, positively oriented parametric curve C. Use Green's Theorem to explain why the area of R is equal to the path integral

$$\int_C x\,dy.$$

Problem 2. The *lemniscate of Gerono* is a curve C in the plane resembling a figure-eight:



Then C is given by the implicit expression $x^4 = x^2 - y^2$.

(a) C may also be parametrized by $\gamma(t) = (\sin t, \cos t \sin t)$. Find the appropriate values of t that describe one 'lobe' of the area, as shaded in the figure.

(b) Use Green's Theorem, and Problem 1 if you like, to compute the total area enclosed by the lemniscate of Gerono.