**Math 252 -- Calculus II -- Lab 6**

**Names:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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*We agree that everyone whose name is on this lab contributed fairly to the final paper. If someone has not contributed sufficiently, we will take their name off this worksheet, and they should turn in an individual paper.*

**Labs are best if done in your group, during lab time.**

Late labs will be penalized 20%, and will only be accepted up to one week late.

Any group lab turned in by an individual will be penalized 10%.

**Rules:**

Work together:

Everyone works on the same problem at the same time.

Everyone agrees on the solution before you move on.

Remember that you are practicing your mathematical

communication skills!

Turn in one paper per group. Make sure that the paper you turn in is clean, clear, and organized.

**Part 1: Asteroid Fragments (based on Stewart Instructor's Manual, p. 390)**

Consider the function shown below. This function is known as an "asteroid" or as a "hypocycloid of four cusps." It's rather like an inside-out circle.





Sketch the curve in the first quadrant, and shade the part bounded by the curve and the x and y axes:

**(1)** Solve the equation for x -- you may assume that both x and y are positive, since we're in the first quadrant. Simplify as much as possible.

Solve the equation for y -- you may assume that both x and y are positive, since we're in the first quadrant. Simplify as much as possible.

**(2)** Find the area enclosed by the asteroid in the first quadrant:

**(3)** Compute the volume generated by rotating the part of the asteroid in the first quadrant about the y-axis, using cylindrical shells. Show your work clearly!

**(4)** Compute the same volume using disks or washers. Show your work clearly!

**Part 2:** Practice Integration By Parts -- Check every one by taking the derivative.

**A very important hint for taking the integral of any function that involves a logarithm:**

**Use integration by parts, and always let u equal the log.**

**(except in the rare cases where you can use u-sub instead)**

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| **(1)** | check? |
| **(2)** | check? |
| **(3)** | check? |
| **(4)** | check? |

**(5)** 

check?