Part 1 – Setting Up The Problem And Understanding The Concept

A first step to solve calculus volume problems is to label the point and differential. You know the volume of an object is the area of the base times its height. So the differential *dV* equals area·*dx* or area·*dy*.

1. Typically the cross section is perpendicular to an axis. If the shape formed is perpendicular to the *x*-axis, what is the differential?

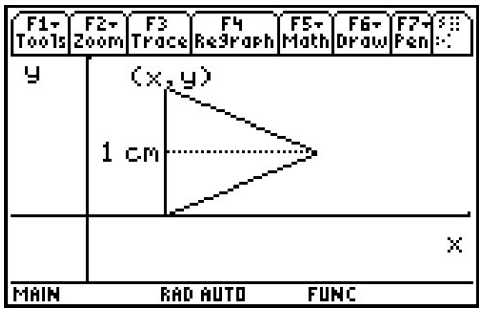
2. The function may define the base with cross sections that form a variety of shapes.

a. What is the area of a square?

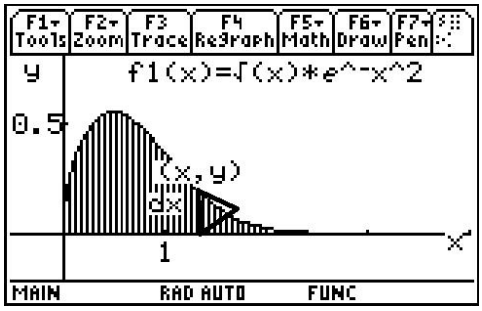
b. What is the area of a semicircle?

3. Consider a function that defines the base of a solid where the cross sections perpendicular to the *x*-axis form equilateral triangles. Let the base of the triangle be parallel to the *y*-axis. What is the area of the triangle? Draw a sketch and justify your answer.

4. If the length of one of the sides of this equilateral triangle is 1 cm, calculate the area. Show your calculation.



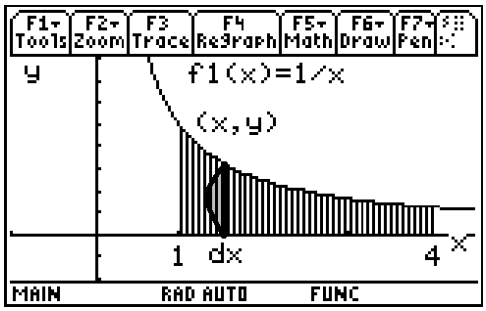
5. Let the first quadrant region enclosed by the graph of $y = \sqrt{x} \cdot e^{-x^2}$ and the line $x = 2$ be the base of a solid. If the cross sections perpendicular to the *x*-axis are equilateral triangles, what is the volume of the solid? Show your work.



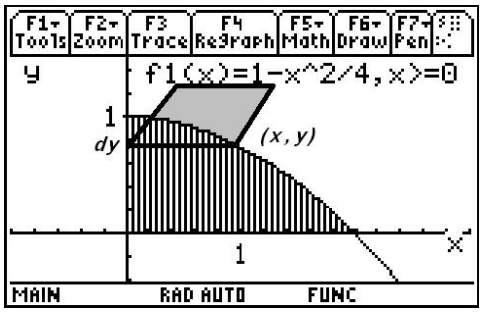
Part 2 – Homework

Questions 1 and 2 are non-calculator, exam-like problems. Show all your work. On Question 3, just show the set up and then use your calculator to find your answer.

1. Let the first quadrant region enclosed by the graph of $y = \frac{1}{x}$ and the line $x = 1$ and $x = 4$ be the base of a solid. If the cross sections perpendicular to the x axis are semicircles, what is the volume of the solid? Show your work.



2. Let the base of a solid be the first quadrant region enclosed by the x-axis, the y-axis and the graph of $y = 1 - \frac{x^2}{4}$. If all the cross sections perpendicular to the y-axis are squares, what is the volume of the solid? Show your work.



3. Let the base of a solid be the first quadrant region enclosed by the x-axis and one arch of the graph $y = \sin(x)$. If all cross sections perpendicular to the x-axis are squares, then approximately what is the volume of the solid? Show your set up.