MATH 200 - SEC 201 - 2010W

Assignment no. 4

Due: 9am, Mar 30, 2011

1. Consider the figure 8 shape given by the equation $x^2 = y^2 - y^4$ (see figure 1). Write the area bounded by this curve as an iterated integral in Cartesian (rectangular) coordinates in 2 ways and as an iterated integral in polar coordinates. Calculate one of these integrals (bonus points if you do it in more than 1 way).

2. Calculate the volume of the torus (a.k.a. doughnut) given by the equation $(x^2 + y^2 + z^2 + 3)^2 = 16(x^2 + y^2)$ (see figures 2,3). Hint: first write this as a region of type I by checking for which (x, y) is there a z which solves the equation. Then look for the most convenient way to turn this into iterated integral.

3. Let R be the body bounded by the surfaces $z = 0$, $z = y$ and $y = 1 - x^2$. Write the integral of $F(x, y, z) = y$ over R as an iterated integral in all six possible ways and calculate it.

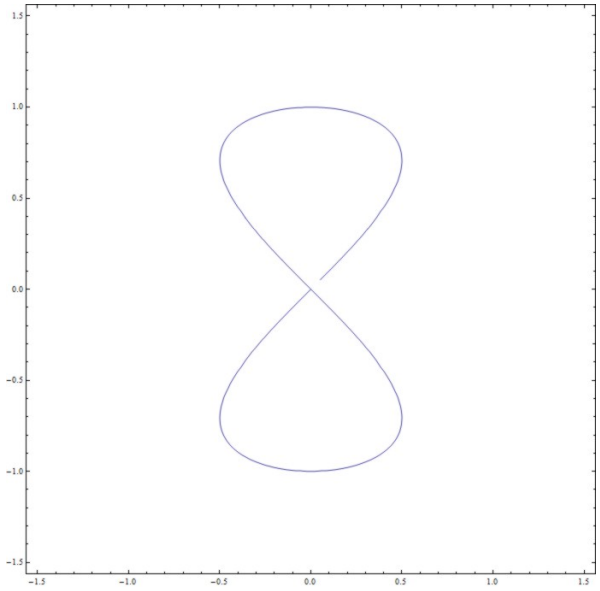

Figure 1: The curve $x^2 = y^2 - y^4$

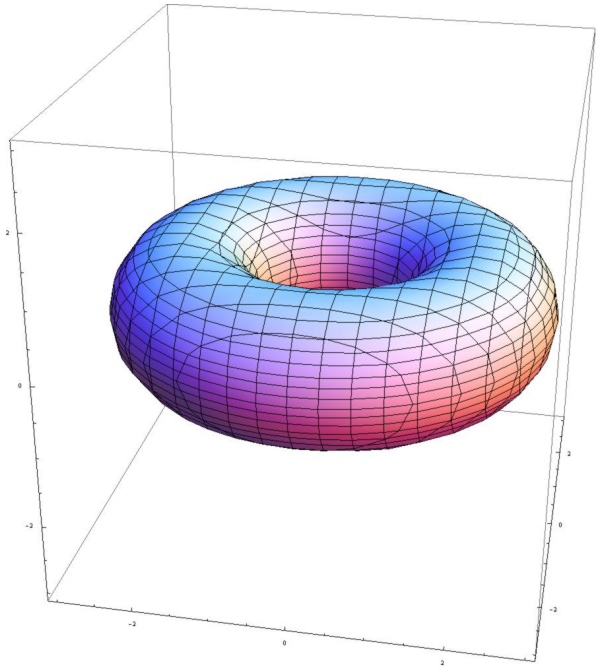

Figure 2: The torus $(x^2 + y^2 + z^2 + 3)^2 = 16(x^2 + y^2)$

Figure 3: Bon appétit!