Worksheet 6

Claudiu Raicu

September 21, 2009

I. Find the length of the curves

1. $y = \sqrt{x - x^2} + \sin^{-1}(\sqrt{x}),\ 0 \le x \le 1.$
2. $y = \ln\left(\dfrac{e^x + 1}{e^x - 1}\right),\ a \le x \le b,\ a > 0.$
3. $y = \displaystyle\int_0^x \sqrt{t^3 - 1}dt,\ 1 \le x \le 4.$
4. Find the arc length function for the curve $y = 2x^{3/2}$ with starting point $P_0(1, 2)$.

II. Find the area of the surface obtained by rotating

5. The curve $y = \sin(\pi x)$, $0 \le x \le 1$ about the x-axis.
6. The curve $x = \sqrt{a^2 - y^2}$, $0 \le y \le a/2$ about the y-axis.
7. The curve $y = \dfrac{1}{4}x^2 - \dfrac{1}{2}\ln(x)$, $1 \le x \le 2$ about the y-axis.
8. The infinite curve $y = e^{-x}$, $x \ge 0$ about the x-axis.

III. Find the centroid of the region bounded by the curves

9. $y = x^2$ and $x = y^2$.
10. $y = 1/x$, $y = 0$, $x = 1$, $x = 2$.
11. A large tank is designed with ends in the shape of the region between the curves $y = \frac{1}{2}x^2$ and $y = 12$, measured in feet. Find the hydrostatic force on one end of the tank if it is filled to a depth of 8 ft with gasoline. (Assume the gasoline's density is 42.0 lb/ft^3.)
12. Use the Theorem of Pappus to find the volume of a cone with height h and base radius r.