Homework 8: Solids of Revolution, Known Cross-Sections, Arclength and Mass (due Mar. 2)

1. Compute the volume of the solid obtained by revolving the following region about the x-axis: The region bounded by $y = \frac{1}{x+1}$, $y = 0$, $x = 0$ and $x = 1$. The answer you should get is $\frac{\pi}{2}$.

2. Set up the integral that gives the volume of the solid obtained by revolving the following region about the line $y = 3$: The region bounded by $y = \sqrt[3]{x}$, $x = 4y$, $x \geq 0$ and $y \geq 0$.

3. Compute the volume of the solid whose base is the region bounded by $y = x^2$, $y = 1$ and $x \geq 0$ whose cross-sections perpendicular to the x-axis are

(a) Squares

(b) Semi-Circles

4. Do number 54 from Section 8.2

5. Find a function whose arclength from $x = a$ to $x = b$ is given by $\int_a^b \sqrt{x^2+1}\,dx$

6. Calculate the total mass of a 3×5 rectangular sheet, whose surface density is given by $\delta(x) = \frac{1}{1+x^4}$, where x is the distance from one of the sides of length 5.

7. A rod of length 3 meters has density $\delta(x) = 1 + x^2$ grams/meter, where x is the distance from one of the ends of the rod. Find the total mass of the rod.

8. Set up the integral that gives the mass of a pyramid with density $\delta(y) = e^{-y}$, where y represents vertical distance from the base of the pyramid. Assume the pyramid has a square base of side-length 100 and height 200.