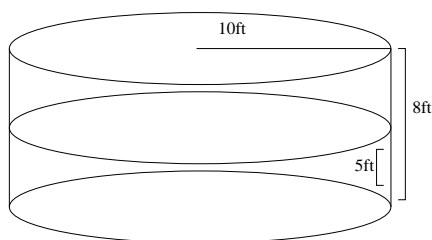# Solution to Problem 4

October 5, 2009

Figure 1: Swimming pool for Problem 4.

Say we place the origin at the bottom of the cylinder. The area of the horizontal cross-sections of the cylinder are constant as a function of the height.

$$A(y) = 100\pi \qquad \text{(5pts.)}$$

The integral for the work is

$$W = \int_0^5 62.5 A(y)(8 - y) dy \qquad \text{(5pts.)}$$

Integrating the function

$$W = 62.5 \int_0^5 100\pi(8 - y) dy = 6250\pi \int_0^5 (8 - y) dy = 6250\pi \left[8y - \frac{y^2}{2} \right]_0^5 \text{ (5pts.)}$$

Evaluating

$$W = 6250\pi \left(40 - \frac{25}{2} \right) = 6250\pi \left(\frac{55}{2} \right) = 3125 \cdot 55\pi = 171,875\pi \quad \text{(5pts.)}$$