

**10.** (14 points) A cylindrical tank is has a circular cross section of radius 2 meters and a length of 4 meters. It is to be filled with a compressible liquid whose density varies with its height and is equal to  $\rho(h) = 60\sqrt{1+h}$  kg/m<sup>3</sup> at  $h$  meters below the surface of the liquid.

**(a)** Suppose the tank is standing on one of its circular ends (figure 1) and is filled with the liquid. What is the approximate mass in a thin horizontal slice of thickness  $\Delta h$  that is  $h$  meters below the top of the tank?

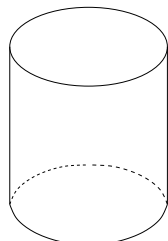


Figure 1

**(b)** Write a definite integral whose value is equal to the total mass of the liquid in the tank.

**(c)** Evaluate your integral from part (b) to find the total amount of liquid in the tank. Show your work, or explain how you obtained your answer.