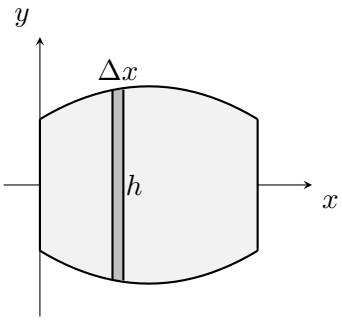
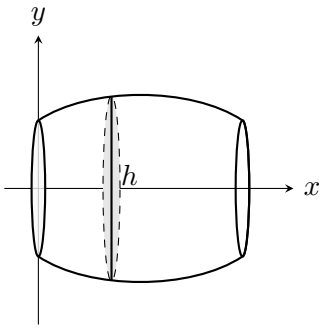
7. [10 points] Gragas, a brewmaster, gifts his friend Braum a barrel **full** of whiskey. Braum wants to determine the total mass of the alcohol stored inside.
The side view of the barrel, shown below and to the left, is bounded by the vertical lines $x = 0$ and $x = 60$, and the curves $y = 30 - \frac{1}{90}(x - 30)^2$ and $y = -30 + \frac{1}{90}(x - 30)^2$. All lengths are measured in centimeters.





a. [2 points] Consider a thin vertical strip of the barrel located x cm from the y-axis, as shown in the diagram above and to the left. This strip has a vertical length h. Find a formula for h in terms of x.

Answer: $h =$ _____

b. [4 points] Cross-sections of the barrel perpendicular to the x-axis are circles. Consider a thin cylindrical slice located x cm from the y-axis, with thickness Δx. Find an expression for the volume of that slice. Your answer should **not** involve any integrals, and should **not** include the letter h. Include units.

Answer: _____ **Units:** _____

c. [4 points] Braum determines that the density of the liquid varies along the length of the barrel according to the function $\rho(x) = 0.01x + 1$, measured in g/cm^3.
Write an expression involving one or more integrals that represents the total mass of the whiskey inside the barrel. **Do not** evaluate any integrals in your expression. Your answer should **not** involve the letters h or ρ. Include units.

Answer: _____ **Units:** _____