1. A large rock is released from rest into a lake and allowed to drop. The rock’s acceleration after $t$ seconds is $a = -6.54e^{-0.7t}$ m/s$^2$.

(a) Determine the velocity of the rock after $t$ seconds.

(b) What is the rock’s depth after $t$ seconds?

(c) How many seconds does it take for the rock to sink 300 meters?

(d) What is the eventual velocity of the rock (as $t \to \infty$)?
2. Consider a tin can with radius \( r = 3 \text{ cm} \) and height \( h = 15 \text{ cm} \).

The side of the can has a thickness of 0.1 mm, while the top and bottom have a thickness of 0.2 mm. Estimate the total volume of metal used to make the can.
3. The following figure shows the region under the graph of $y = x^2$ from $x = 0$ to $x = L$.

Let $h$ be the height of the region, and let $A$ be the area.

(a) Find a formula for the height $h$ in terms of the length $L$.

(b) Suppose we increase $L$ by a small amount $dL$, causing the area $A$ to increase by a small amount $dA$. Find a formula for $dA$ in terms of $L$ and $dL$.

(c) Divide through by $dL$ to obtain a formula for $\frac{dA}{dL}$.

(d) Use your answer to part (c) to find a formula for the area $A$ in terms of the length $L$. 
4. A bowl with the shape of a parabola is partially filled with water.

(a) Find a formula for the radius $r$ of the water in terms of its height $h$.

(b) Suppose we pour slightly more water into the bowl, increasing the height by a small amount $dh$. Find a formula for the volume $dV$ of water that was added in terms of $h$ and $dh$.

(c) Use your answer to part (b) to find a formula for the volume $V$ of the water in terms of the height $h$. 