Assignment: Volumes of Revolution

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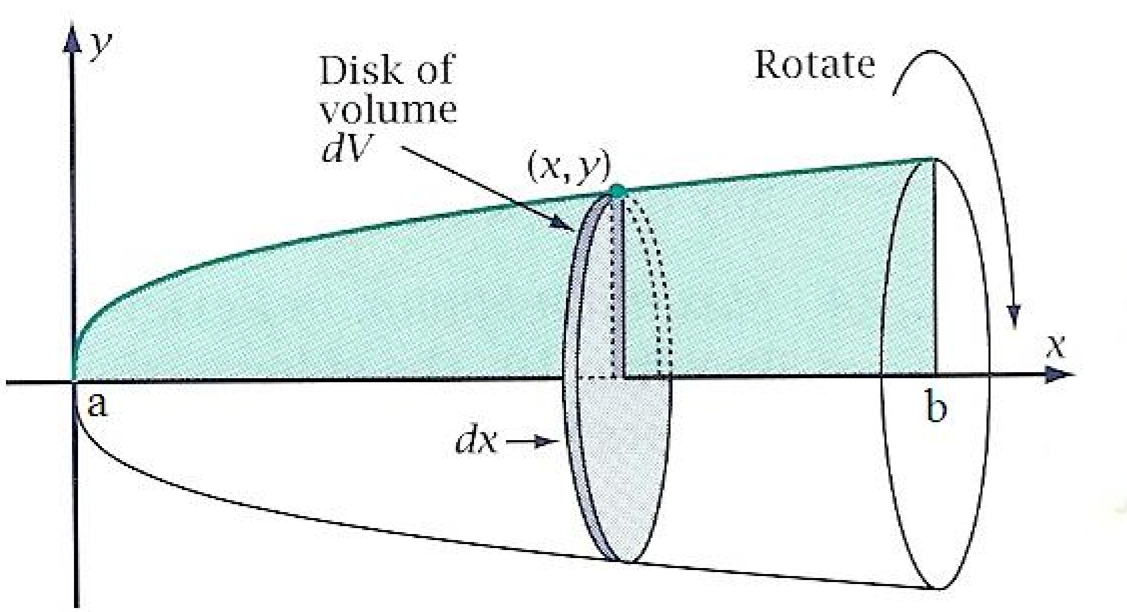
Recall that the reading for the *Integration II* homework gave you a formula for the volume enclosed by rotating the graph of some function $y = f(x)$ around the x-axis from $x = a$ to $x = b$,

$$V = \pi \int_a^b y^2 dx.$$



Another example of a volume of revolution, this time $y = \sqrt[3]{x}$ from $x = a$ to $x = b$.

This assignment will lead you through an application of this formula to find the volume of a familar shape from primary school. The volume of this shape was previously not possible for you to find using high school geometry, despite its simplicity, and the fact that you can do it now demonstrates the power of calculus methods.

1. Suppose f is a function of x, and that you know that the graph $y = f(x)$ is a straight line. Furthermore, assume that $f(0) = 0$ and $f(h) = r$ where h and r are constants. Find a formula for f, and draw its graph.

2. Find a formula for the volume enclosed by rotating the graph $y = f(x)$ around the x-axis between the origin ($x = 0$) and $x = h$. Sketch a diagram showing the volume.

3. Write an intuitive explanation (for someone who has not studied the volume of integration formula) describing (a) what you have found and (b) how you found it.