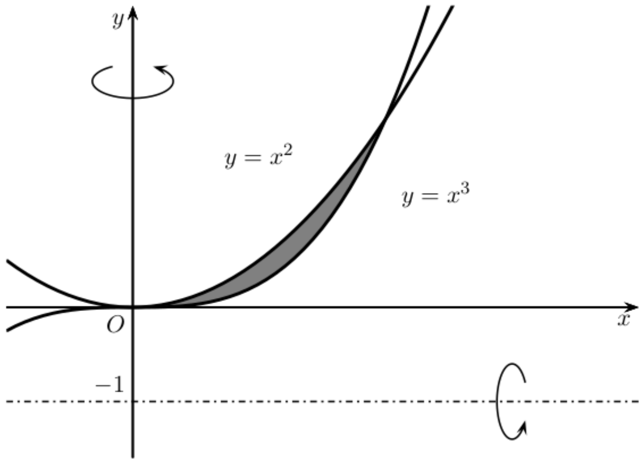
Calculus Volume of Solids of Revolution

The formula for finding the volume of a solid of revolution around an axis is $\pi \int_a^b f(x)^2\,dx$.

Consider this question:

Find the volume of the solids generated by revolving the region bounded by $y = x^2$ and $y = x^3$ (i) about the y-axis, and (ii) about the line $y = -1$.



The intersection points are $(0,0)$ and $(1,1)$.

i) To revolve the region around the <u>vertical</u> y axis, we need to represent the equations in terms of x . The equations can be rewritten as $x=\sqrt{y}$ and $x=\sqrt[3]{y}$.

Volume: $\pi \int_0^1 (\sqrt[3]{y})^2\,dy - \pi \int_0^1 (\sqrt{y})^2\,dy$

ii) To revolve the region around the <u>horizontal</u> line $y=1$, we need to represent the equations in terms of y . The equations are $y=x^2$ and $y=x^3$.

Also, the formula of the volume of a curve around a line $y=a$ is $\pi \int_a^b [f(x)-a]^2\,dx$.

Volume: $\pi \int_0^1 [x^2-(-1)]^2\,dx - \pi \int_0^1 [x^3-(-1)]^2\,dx$

Volume (Simplified): $\pi \int_0^1 [(x^2+1)^2-(x^3+1)^2]\,dx$

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