

6.3

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6.3: Volumes by Cylindrical Shells.

Ex1: Rotate the region bounded by  $y = 2x^2 - x^3$  and  $y = 0$  about the  $y$ -axis & find the volume of the resultant solid

ARGH.

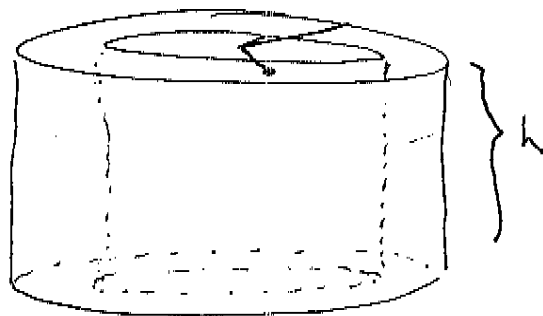
A cylindrical shell

Volume of the shell ...

$$\begin{aligned} V &= \pi r_1^2 h - \pi r_2^2 h \\ &= \pi h (r_1^2 - r_2^2) \\ &= \pi h (r_1 + r_2) \underbrace{(r_1 - r_2)}_{\Delta r} \\ &= 2\pi h \left( \frac{r_1 + r_2}{2} \right) \Delta r \end{aligned}$$

$$= 2\pi h r \Delta r.$$

$$= \text{circum.} \cdot \text{height} \cdot \text{thickness.}$$

Ex1 rev:

Ex2: Find the volume when the region bounded by  $y = x^2$  and  $y = \sqrt{x}$

Ex3: Find the volume of the torus.