

Volume of revolution application

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Figure 1:

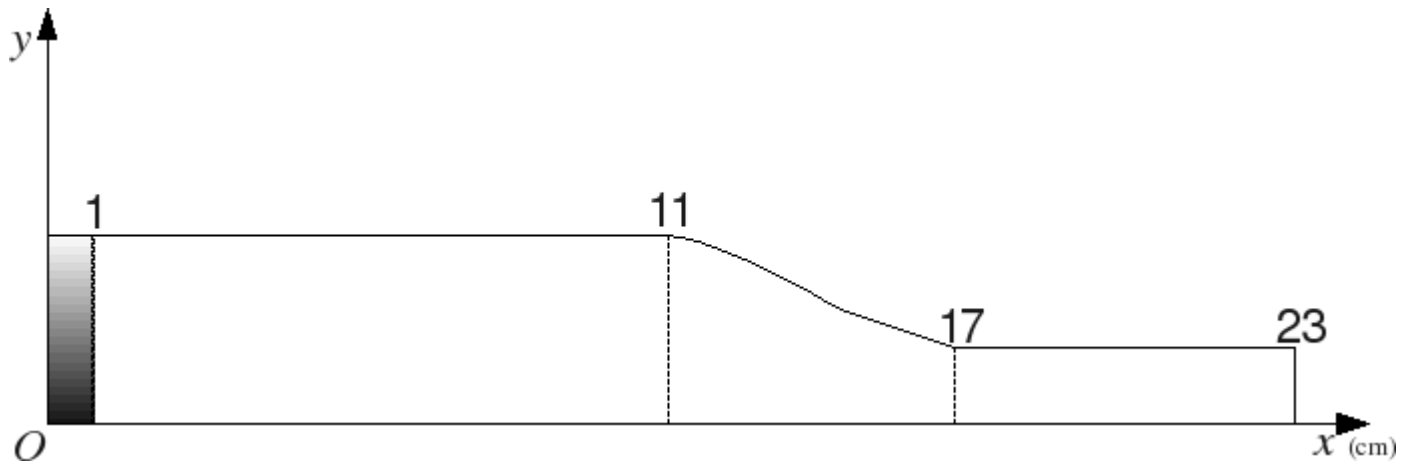


Figure 2: O

$$\begin{aligned}
 V &= \sum \int_a^b \pi y^2 dx = \pi \left[10 \times 3^2 + \frac{1}{100} \int_{11}^{17} \left(17 \cos \frac{\pi}{12} (x-11) + 13 \right)^2 dx + 6 \times \left(\frac{13}{10} \right)^2 \right] \\
 &= \pi \left[100 \frac{7}{50} + \frac{1}{100} \int_{11}^{17} \left(289 \cos^2 \frac{\pi}{12} (x-11) + 442 \cos \frac{\pi}{12} (x-11) + 169 \right) dx \right] \\
 &= \pi \left[100 \frac{7}{50} + \frac{1}{100} \int_{11}^{17} \left(\frac{289}{2} \cos \frac{\pi}{6} (x-11) + 442 \cos \frac{\pi}{12} (x-11) + \frac{627}{2} \right) dx \right] \\
 &= \pi \left[100 \frac{7}{50} + \frac{1}{100} \left[\frac{867}{\pi} \sin \frac{\pi}{6} (x-11) + \frac{5304}{\pi} \sin \frac{\pi}{12} (x-11) + \frac{627}{2} x \right]_{11}^{17} \right] \\
 &= \pi \left[100 \frac{7}{50} + \frac{1}{100} \left(\frac{867}{\pi} \sin \pi + \frac{5304}{\pi} \sin \frac{\pi}{2} + \frac{627}{2} \times 17 - \frac{867}{\pi} \sin 0 - \frac{5304}{\pi} \sin 0 - \frac{627}{2} \times 11 \right) \right] \\
 &= \pi \left[100 \frac{7}{50} + \frac{1}{100} \left(\frac{5304}{\pi} + 1881 \right) \right] = \underline{\underline{\left[\left(\frac{11819}{20} \right) \pi + 53 \frac{1}{25} \right] \text{cm}^3}} \quad (\approx 427 \text{cm}^3)
 \end{aligned}$$