

Let R be the region bounded by $y = 10 - 2x$, the x-axis, and the y-axis. Compute the volume of the solid formed by revolving R about the y-axis.

A. 25π

B. 50π

C. $\frac{250}{3}\pi$

D. $\frac{500}{3}\pi$

Solution:

$$y = 10 - 2x$$

Find y-intercept

$$x = 0 \Rightarrow y = 10$$

$$\begin{aligned} V &= \pi \int_0^{10} (x(y))^2 dy = \pi \int_0^{10} \left(5 - \frac{y}{2}\right)^2 dy = -2\pi \int_0^{10} \left(5 - \frac{y}{2}\right)^2 d\left(5 - \frac{y}{2}\right) \\ &= -2\pi \frac{\left(5 - \frac{y}{2}\right)^3}{3} \Big|_0^{10} = -2\pi \left(\frac{(5-5)^3}{3} - \frac{(5)^3}{3}\right) = \frac{250}{3}\pi \end{aligned}$$

Answer: C $\frac{250}{3}\pi$