# CALCULUS
# Volume by slices and the disk and washer methods: Problems
# NEW

0720-1. NEW Let $R$ be the region bounded by $y = x + 2$ and $x = 4$ in $2 \leq y \leq 3$.

a. Sketch $R$.

b. Find the volume of the solid obtained by rotating $R$ about the $x$-axis.

c. Find the volume of the solid obtained by rotating $R$ about the $y$-axis.

0720-2. NEW Let $R$ be the region bounded by $y = x^2$ and $y = 2x$.

a. Sketch $R$.

b. Find the volume of the solid obtained by rotating $R$ about the $x$-axis.

c. Find the volume of the solid obtained by rotating $R$ about the line $x = -2$.

0720-3. NEW Let $R$ be the region bounded by $y = \ln x$, $x = 9$ and $y = 1$.

a. Sketch $R$.

b. Find the volume of the solid obtained by rotating $R$ about the $y$-axis.

0720-4. NEW Let $R$ be the region bounded by $y = \cos x$ and $y = 0$ in $0 \leq x \leq \frac{\pi}{3}$.

a. Sketch $R$.

b. Find the volume of the solid obtained by rotating $R$ about the $x$-axis.

Hint: $\cos^2 x = \dfrac{1 + [\cos(2x)]}{2}$

NEW 0720-5. Let $R$ be the region bounded by

$$(x-1)^2+(y-4)^2=9.$$

a. Sketch $R$.

b. Find the volume of the solid obtained by rotating $R$ about the $x$-axis.

Note: This solid is called a torus. It is in the shape of a doughnut.

Hint: Remember that $2\int_{-3}^{3}\sqrt{9-u^2}\,du$ is known; it is the area enclosed in a circle of radius 3.

0720-6. NEW Let $R$ be the region bounded by

$$y = x^5 \text{ and } x = y^6.$$

a. Sketch $R$.

b. Find the volume of the solid obtained by rotating $R$ about the line $y = -1/2$.

c. Find the volume of the solid obtained by rotating $R$ about the line $x = -1/3$.

0720-7. NEW Let $R$ be the region bounded by

$$y = x^4 \text{ and } x = y^6.$$

a. Sketch $R$.

b. Find the volume of the solid obtained by rotating $R$ about the line $y = -1/2$.

c. Find the volume of the solid obtained by rotating $R$ about the line $x = -1/3$.

0720-8. NEW Let $R$ be the region bounded by $x = 2 + e^y$, $x = \sin y$ in $0 \le y \le \pi/2$.

Set up, but do not evaluate, an integral that yields the volume of the solid obtained by rotating $R$ about the line $x = 6$.

0720-9. NEW Describe the solid of revolution whose volume is given by

$$\pi \int_1^{3/2} \left(9e^{2y} - 2\right)\, dy.$$

Do not evaluate this integral.

0720-10. NEW Describe the solid of revolution whose volume is given by

$$\pi \int_0^{\pi/2} (4 + \cos y)^2 - 16\, dy.$$

Do not evaluate this integral.

0720-11. NEW A solid $S$ sits above a horizontal plane $P$. $\forall x \geq 0$, let $P_x$ be the horizontal plane that is $x$ units above $P$. Suppose that $S$ lies between $P_1$ and $P_2$. Suppose, also, that $\forall x \in [1, 2]$, the intersection of $S$ and $P_x$ is the region inside a rectangle

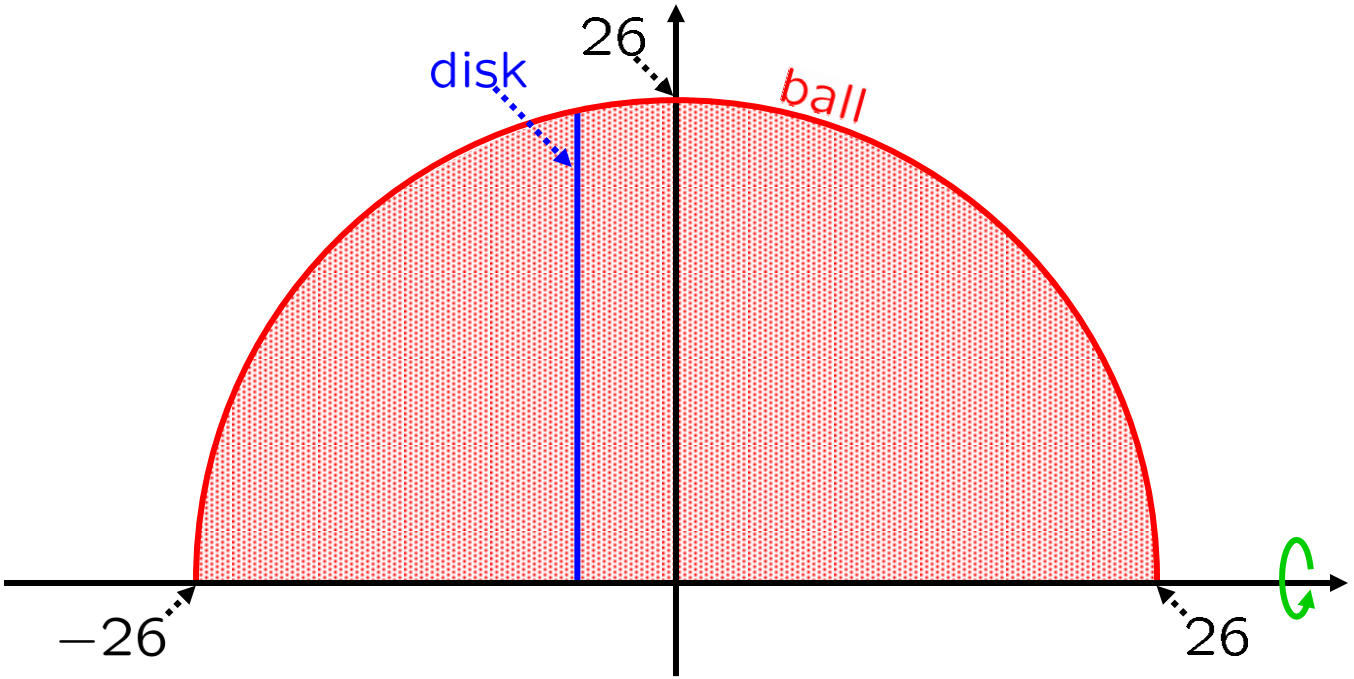
whose base has length $5x$

and whose altitude has length $e^{3x^2}$.

Compute the volume of $S$.

NEW

0720-12. Using the disk method, find the volume in a ball of radius 26, following the diagram shown below.



NEW

0720-13. We create a napkin holder by drilling a cylindrical hole of radius 10 through the middle of a ball of radius 26, as shown below. Using the washer method, find its volume.