

1. The area of the region bounded by the graphs of $y = e^x + 1$, $x = 0$ and the line $y = 6$ is

- (A) $5\ln 5 - 4$ (B) $8\ln 2 - 3$ (C) $5\ln 5 + 5$
(D) $10\ln 2 - 4$ (E) $10\ln 2 + 4$

2. The region enclosed by the graphs of $y = 3e^x$ and $y = 3$ on $0 \leq x \leq 1$ is revolved about the y -axis. The volume of this solid is

- (A) $\pi \int_3^{3e} \left(3 - \ln \frac{y}{3}\right)^2 dy$
(B) $\pi \int_0^1 (3e^x - 3)^2 dx$
(C) $\pi \int_3^{3e} \left(1 - \ln^2 \frac{y}{3}\right) dy$
(D) $\pi \int_0^3 \left(1 - \ln \frac{y}{3}\right)^2 dy$
(E) $\pi \int_3^{3e} \left(1 - \ln \frac{y}{3}\right)^2 dy$
-

3. Which of the following is the length of $y = \ln(\cos x)$ between $0 \leq x \leq \frac{\pi}{3}$?

(A) $\ln(2 + \sqrt{2})$ (B) $\ln(1 + \sqrt{3})$ (C) $\ln(2 - \sqrt{3})$

(D) $\ln(2 + \sqrt{3})$ (E) $\ln(\sqrt{3} - 1)$

4. A region is bounded by $y = \frac{1}{x}$, the x -axis, the line $x = m$, and the line $x = 2m$, where $m > 1$. If the volume of the solid formed by revolving the region about the x -axis equals 0.125, what is the value of m ?

(A) 1.133 (B) 1.334 (C) 2.998

(D) 7.510 (E) There is no such value

5. Let R be the region in the first quadrant bounded by $y = \sqrt{x}$ and the line $y = 1$ on $1 \leq x \leq 2$. Which of the following integrals gives the volume of the solid generated when R is rotated about the x -axis?

(a) $\pi \int_1^2 (x-1) dx$

(b) $\pi \int_1^2 (x-1)^2 dx$

(c) $\pi \int_1^2 (\sqrt{x}-1)^2 dx$

(d) $\pi \int_1^2 (2-x)^2 dx$

(e) $\pi \int_1^2 (2-\sqrt{x})^2 dx$

6. The base of a solid is the region bounded by $y = \sin x$ and $y = \cos x$ for $0 \leq x \leq \frac{\pi}{4}$. If each cross-section of the solid perpendicular to the x -axis is a square, the volume of the solid is

(a) 0.306

(b) 0.256

(c) 0.315

(d) 0.286

(e) 0.257

7. The region R is bounded by the lines $y = 2x - 4$, $x = 3$, and $y = 0$. Which of these expressions gives the volume of the solid formed by revolving R around the line $x = 5$?

(a) $\int_2^3 \left((2x - 4)^2 - 3^2 \right) dx$

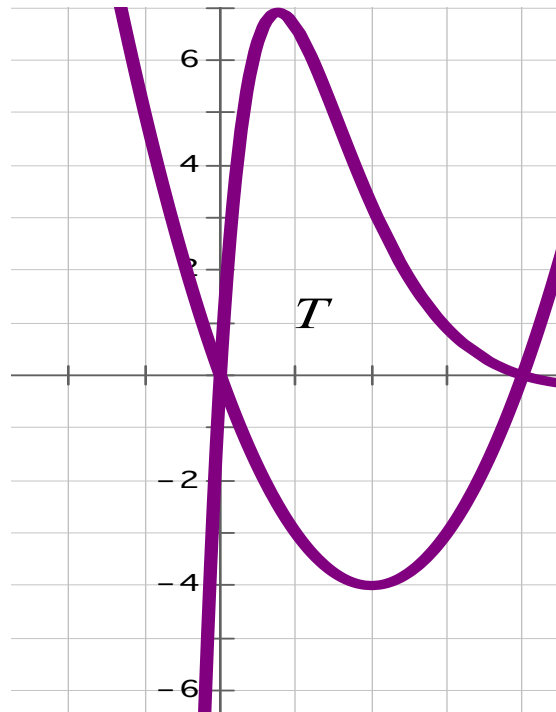
(b) $\int_2^3 \left((2x - 9)^2 - 2^2 \right) dx$

(c) $\int_0^2 \left(\left(\frac{y+4}{2} \right)^2 - 3^2 \right) dy$

(d) $\int_0^2 \left(\left(\frac{y-6}{2} \right)^2 - 2^2 \right) dy$

(e) $\int_0^6 \left(\left(\frac{y+4}{2} \right)^2 - 3^2 \right) dy$

1. Region T is bounded by the curves $f(x) = -6(x^2 - 4x)e^{-x}$ and $g(x) = x^2 - 4x$



-
- (a) Find the area of region T . Show the set-up.
-

(b) Find the volume of the solid generated when R is revolved about the line $y = -4$.

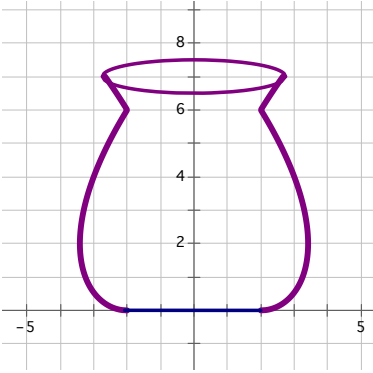
(c) Let the base of the solid be the region R. Find the volume of the solid where the cross-sections perpendicular to the x -axis are squares.

2. Mrs Quattrin bought a handmade ceramic pitcher that was created on a potter's wheel (think Patrick Swayze and Demi Moore in *Ghost*...or Leslie Nielsen and Priscilla Presley in *Naked Gun*). Wanting to know the volume, she measures the radius of the pitcher at one inch increments and records the data on the table below.

H inches	0	1	2	3	4	5	6	7
$r(h)$ inches	2	3.25	3.4	3.3	3	2.56	2	2.66

h is the height from the bottom of the pitcher and $r(h)$ is the radius at each height.

a) a) Using a right-hand Riemann sum, approximate $\pi \int_0^7 [r(h)]^2 dh$, the volume of the pitcher.



b) Using a calculator to do a quartic regression on the data, Mrs Quattrin finds that the data is modeled by $R(h) = 2 + \frac{1}{4}(h-6)\sqrt{h}$. Find the volume of the pitcher if this model is rotated about the h -axis.

c) Using the kitchen faucet, Mrs Quattrin fills the pitcher with water. The faucet delivers water at $1.13 \text{ in}^3/\text{sec}$. The model indicates that the volume equation would be $V(h) = \pi \int_0^h \left(2 + \frac{1}{4}(x-6)\sqrt{x} \right)^2 dx$. How fast is h changing when the height is 4.2 inches?