

1. What is the area enclosed by $y = \ln(2x + 1)$ and $y = 2 \sin x$?

- a) 0.334
- b) 0.661
- c) 3.526
- d) 0.825
- e) 2.983

2. A region is bounded by $y = \frac{2}{\sqrt{x}}$, the x -axis, the line $x = m$, and the line $x = 2m$, where $m > 0$. The area of this region:

- a) is independent of m .
 - b) increases as m increases.
 - c) decreases as m increases.
 - d) increases until $m = \frac{1}{2}$, then decreases.
 - e) is none of the above
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3. Let R be the region in the first quadrant bounded by $x = \sin^{-1} y$, the x -axis, and $x = \frac{\pi}{2}$. Which of the following integrals gives the volume of the solid generated

when R is rotated about the line $x = \frac{\pi}{2}$?

a) $\pi \int_0^{\pi/2} y^2 dy$

b) $\pi \int_0^1 \left(\frac{\pi}{2} - \sin^{-1} y\right)^2 dy$

c) $\pi \int_0^{\pi/2} (\sin^{-1} y)^2 dy$

d) $\pi \int_0^1 (\sin x)^2 dx$

e) $\pi \int_0^{\pi/2} \left(\frac{\pi}{2} - \sin x\right)^2 dx$

4. Which of the following integrals gives the length of the graph $y = \sin 2x$ from $x=a$ to $x=b$?

a) $\int_a^b \sqrt{1+4\sin^2 x \cos x} dx$

b) $\int_a^b \sqrt{1+\sin^2 2x} dx$

c) $\int_a^b \sqrt{1+4\cos^2 2x} dx$

d) $\int_a^b \sqrt{1+\cos^2 2x} dx$

e) $\int_a^b \sqrt{1+4\sin^2 x \cos^2 x} dx$

5. For $t \geq 0$ hours, H is a differentiable function of t that gives the change in temperature, in degrees Celsius per hour, at an Arctic weather station. Which of the following is the best interpretation of $\int_0^t H(x) dx$?

- a) The total change in temperature during the first t hours.
 - b) The total change in temperature during the first day.
 - c) The average rate at which the temperature changed during the first t hours.
 - d) The rate at which the temperature is changing during the first day.
 - e) The rate at which the temperature is changing at the end of the 24th day.
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6. Let R represent the region in the first quadrant bounded by $y = -3x + 6$. Which expression gives the volume of the solid with base R whose cross-section perpendicular to the x -axis are semi-circles?

- a) $\pi \int_0^2 (-3x + 6)^2 dx$
 - b) $\pi \int_0^6 \left(\frac{6-y}{3}\right)^2 dy$
 - c) $\frac{\pi}{4} \int_0^2 (-3x + 6)^2 dx$
 - d) $\frac{\pi}{8} \int_0^2 (-3x + 6)^2 dx$
 - e) $\frac{\pi}{2} \int_0^6 \left(\frac{6-y}{6}\right)^2 dy$
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7. What is the volume of the solid formed when the region bounded by $y = e^x - 1$, $y = 2$, and $x = 0$ is rotated around the y-axis?

- a) 1.296
 - b) 3.233
 - c) 5.930
 - d) 10.354
 - e) 25.199
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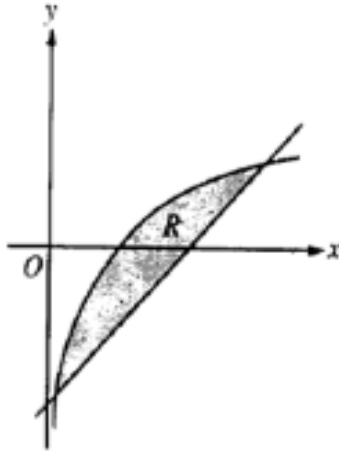
8. Let \mathcal{S} be the region bounded by $y = x^3$, $y = 8$, and $x = 0$.

a) Find the area of \mathcal{S} . Show the setup.

b) Find the volume of the solid generated by revolving \mathcal{S} around the x -axis. Show the anti-differentiation steps.

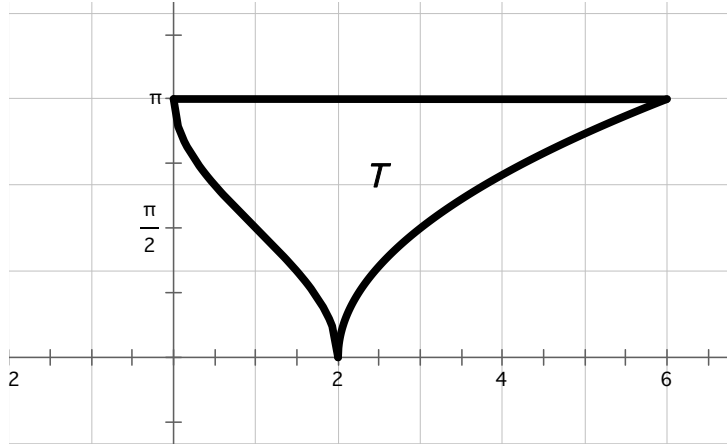
c) There exists a number k , $0 < k < 8$, such that when the part of \mathcal{S} below the line $y = k$ is revolved around the y -axis, the resulting solid has the same volume as the solid formed by when the part of \mathcal{S} above the line $y = k$ is revolved around the y -axis. Write, but do not solve, an equation involving an integral expression that can be used to find the value of k .

9. Let R be the region bounded by $y = \ln x$ and $y = x - 2$.



a) Find the volume of the solid whose base is R and whose cross-sections perpendicular to the y -axis are isosceles right triangles with the one leg is in the base.

b) Find the volume of the solid formed by revolving R around the line $y = 3$.



10. Let T be the region above bounded by

$$y = \frac{\pi}{2} - \sin^{-1}(x-1), \quad y = \frac{\pi}{2} \sqrt{x-2}, \quad \text{and} \quad y = \pi$$

a) Find the perimeter of T . Show the set-up.

b) Find the volume of the solid formed by revolving T around the y -axis.