NO CALCULATOR

1996 AB 2

Let R be the region in the first quadrant under the graph of $y = \frac{1}{\sqrt{x}}$ for $4 \le x \le 9$.

(a) Find the area of R. 2

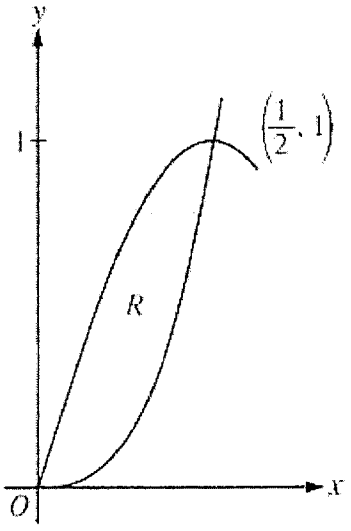
(b) If the line $x = k$ divides the region R into two regions of equal area, what is the value of k? $\frac{25}{4}$

(c) Find the volume of the solid whose base is the region R and whose cross sections cut by planes perpendicular to the x-axis are squares.

$\ln\frac{9}{4} \approx .811$

2011 AB 3

Let R be the region in the first quadrant enclosed by the graphs of $f(x) = 8x^3$ and $g(x) = \sin(\pi x)$, as shown in the figure above.



(a) Write an equation for the line tangent to the graph of f at $x = \frac{1}{2}$. $y - 1 = 6\left(x - \frac{1}{2}\right)$

(b) Find the area of R. .193

(c) Write, but do not evaluate, an integral expression for the volume of the solid generated when R is rotated about the horizontal line $y = 1$.

$\pi \int_0^{1/2} \left[(1 - 8x^3)^2 - (1 - \sin \pi x)^2 \right] dx$

1969 AB 5

1969 AB5

Let R denote the region enclosed between the graph of $y = x^2$ and the graph of $y = 2x$.

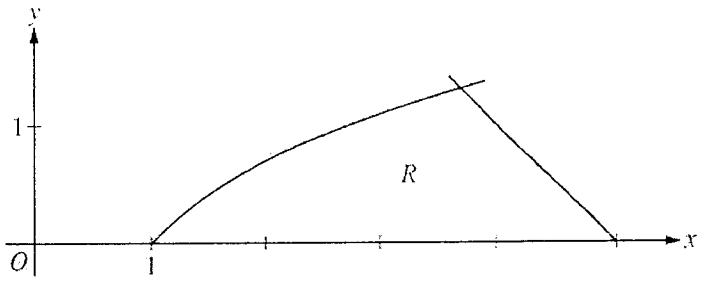
(a) Find the area of region R. $\frac{4}{3}$

(b) Find the volume of the solid obtained by revolving the region R about the y-axis. $\frac{8\pi}{3}$

Calculative-Active

2012 AB 2

Let R be the region in the first quadrant bounded by the x-axis and the graphs of $y = \ln x$ and $y = 5 - x$, as shown in the figure above.



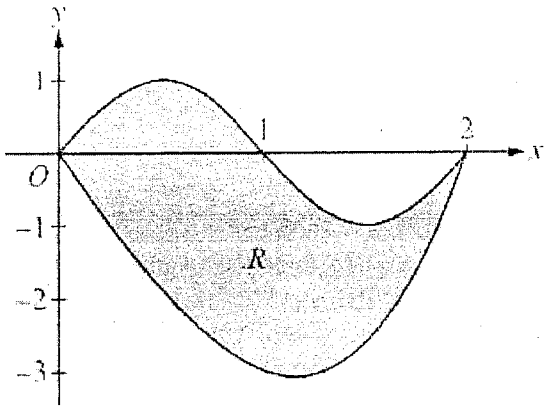
(a) Find the area of R. 2.986

(b) Region R is the base of a solid. For the solid, each cross section perpendicular to the x-axis is a square. Write, but do not evaluate, an expression involving one or more integrals that gives the volume of the solid. $\int_1^{3.693} (\ln x)^2 dx + \int_{3.693}^{5} (5-x)^2$

(c) The horizontal line $y = k$ divides R into two regions of equal area. Write, but do not solve, an equation involving one or more integrals whose solution gives the value of k.

$\int_0^k (5-y-e^y)\,dy = \frac{1}{2}(2.986)$

2008 AB 1



Let R be the region bounded by the graphs of $y = \sin(\pi x)$ and $y = x^3 - 4x$, as shown in the figure above.

(a) Find the area of R. 4

(b) The horizontal line $y = -2$ splits the region R into two parts. Write, but do not evaluate, an integral expression for the area of the part of R that is below this horizontal line. $\int_{.539}^{1.675} (-2-(x^3-4x))\,dx$

(c) The region R is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a square. Find the volume of this solid. 9.978

(d) The region R models the surface of a small pond. At all points in R at a distance x from the y-axis, the depth of the water is given by $h(x) = 3 - x$. Find the volume of water in the pond. 8.370

Review of Area & Volume
AP Calculus AB

1. Find the volume of the solid formed by rotating about the x-axis the region enclosed by the graphs of $y = \sqrt{x} + 1$, the x-axis, the y-axis, and the line x = 4. $\frac{68\pi}{3}$

2. Find the volume of the solid formed by rotating the region bounded by the graph of $y = \sqrt{x} + 1$, the y-axis, and the line y = 3 about the y-axis. (calculator) $\frac{32\pi}{5}$

3. Find the area enclosed by the curve bounded by $f(x) = 5\sqrt{x}$, $g(x) = 4x - 6$ and the y-axis. $\frac{56}{3}$

4. Find the area enclosed by the curve bounded by f(x) = sinx, g(x) = cos x, and the y-axis over [0, π/4]. $\sqrt{2} - 1$

5. Find the area enclosed by the curve bounded by $f(x) = \sqrt{2 - x}$, $g(x) = x^3$, and the y-axis. (calculator) .969

6. Find the area enclosed by the curve bounded by $y = 3x^3 and\ x = 3y^2 - 5$. (calculator) 8.680

7. Find the volume generated when $y = 15 - 2x - x^2$ is rotated about the x-axis on the interval [-5,3]. (calculator) $\frac{16384}{15}\pi$

8. The region bounded by the graphs $y = e^x, y = 1, and\ x = -1$ is rotated about the x-axis. Find the volume of the resulting solid. $\pi\left(\frac{1}{2} + \frac{1}{2e^2}\right)$

9. Find the volume generated when $f(x) = x^2 + 6\ and\ g(x) = 5x$ is enclosed by the y-axis and revolved about the x-axis. $\frac{656}{15}\pi$

10. Find the area between the curves $x = e^y$, $x = y^2 - 2$ and the lines y = -1 and y = 1. $e - \frac{1}{e} + \frac{10}{3}$

11. A region is enclosed by the curves y = x and $y = x^2$.
    a. Find the volume of the solid if it is rotated around the x-axis. $2\pi/15$
    b. Find the volume if it is rotated about the line y = 2. $8\pi/15$
    c. Find the volume if it is rotated about the line x = -1. $\pi/2$

12. Find the volume of the solid obtained by rotating about the x-axis the region under the curve $y = \sqrt{x}$ from x = 0 to x = 1. $\pi/2$

13. Find the volume of the solid obtained by rotating the region bounded by $y = x^3$, y = 8 and x = 0 about the y-axis. $\frac{96\pi}{5}$

14. Find the volume of the solid obtained by rotating the region bounded by y = 3x, y = 2x, and y = 3 about the y-axis. $\frac{5\pi}{4}$

15. Find the volume of the solid obtained by rotating the region under the graph $f(x) = 9 - x^2$ from [0, 3] about the vertical axis x = -2. $\frac{225\pi}{2}$

16. Find the volume of S if the base of a solid S is the region enclosed by the graphs of $y = \sqrt{lnx}$, the line x = e, and the x-axis, and the cross sections of S perpendicular to the x-axis are squares.