For each problem, approximate the area under the curve over the given interval using 4 left endpoint rectangles.

1) $y = -x^2 + 13$; $[-1, 3]$

For each problem, approximate the area under the curve over the given interval using 4 right endpoint rectangles.

2) $y = -\frac{4}{x}$; $[-6, -2]$

For each problem, approximate the area under the curve over the given interval using 4 midpoint rectangles.

3) $y = -\frac{x^2}{2} + x + 5$; $[-2, 2]$

For each problem, approximate the area under the curve over the given interval using 4 trapezoids.

4) $y = \frac{2}{x}$; $[2, 6]$

For each problem, use a left-hand Riemann sum to approximate the integral based off of the values in the table.

5) $\int_{0}^{8} f(x)\,dx$

x	0	1	3	6	8
$f(x)$	1	0	1	0	1

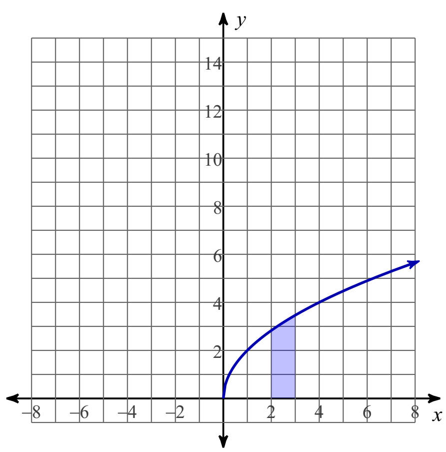
For each problem, use a right-hand Riemann sum to approximate the integral based off of the values in the table.

6) $\int_{0}^{8} f(x)\,dx$

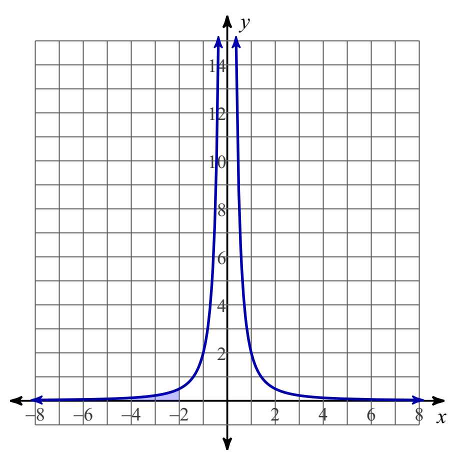
x	0	1	5	6	8
$f(x)$	−3	−2	−3	−2	−3

For each problem, find the area under the curve over the given interval.

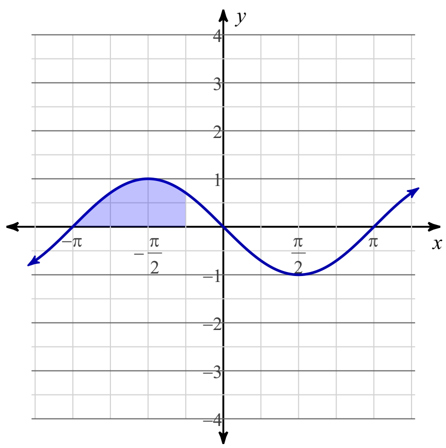
7) $y = 2\sqrt{x}$; $[2, 3]$



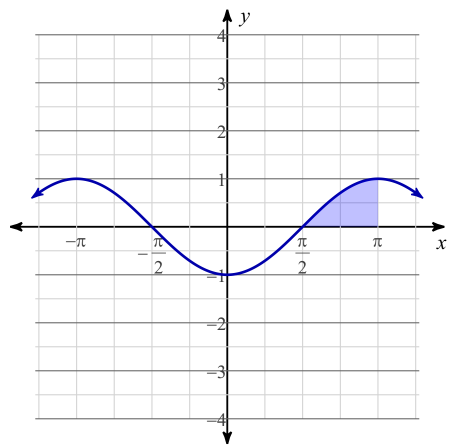
8) $y = \dfrac{2}{x^2}$; $[-4, -2]$



9) $y = -\sin x;\ [-\pi, -\frac{\pi}{4}]$

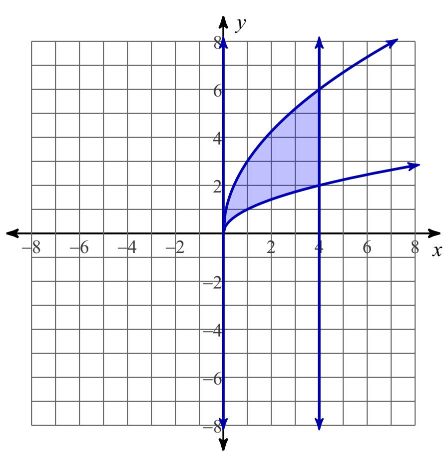


10) $y = -\cos x;\ [\frac{\pi}{2}, \pi]$

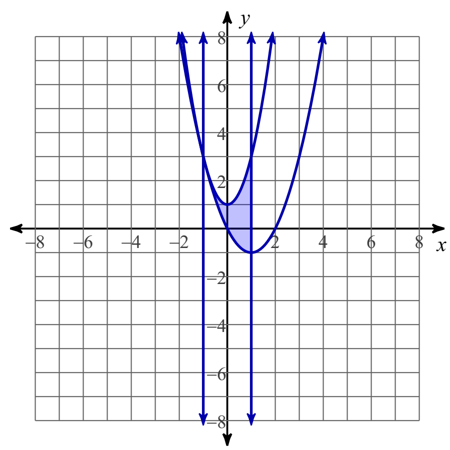


For each problem, find the area of the region enclosed by the curves.

11) $y = 3\sqrt{x},\ y = \sqrt{x},$
$x = 0,\ x = 4$

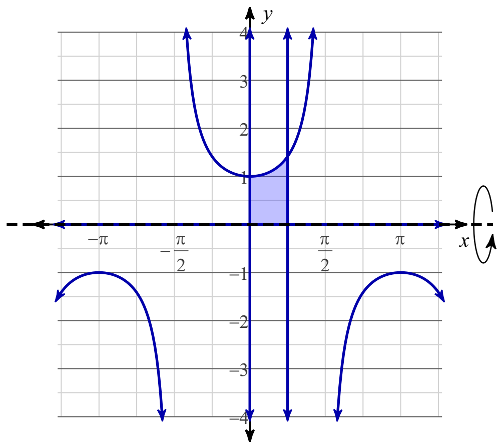


12) $y = 2x^2 + 1,\ y = x^2 - 2x,$
$x = -1,\ x = 1$

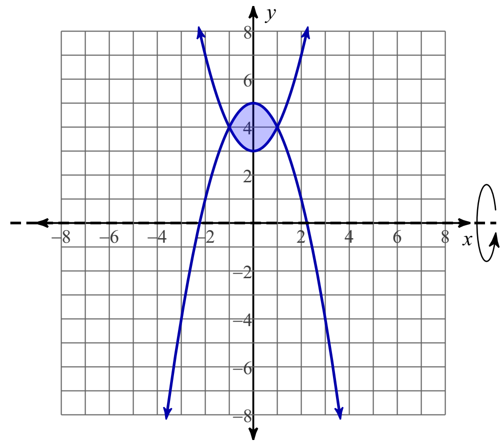


For each problem, find the volume of the solid that results when the region enclosed by the curves is revolved about the *x*-axis.

13) $y = \sec x, \ y = 0, \ x = 0, \ x = \frac{\pi}{4}$

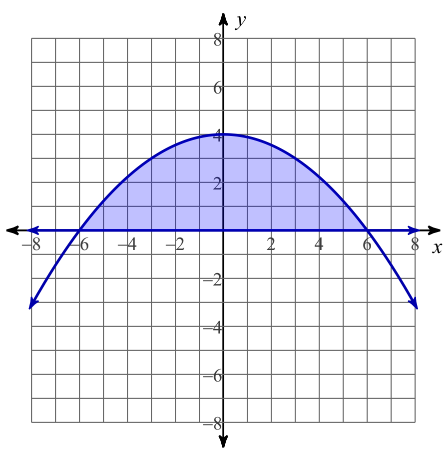


14) $y = -x^2 + 5, \ y = x^2 + 3$

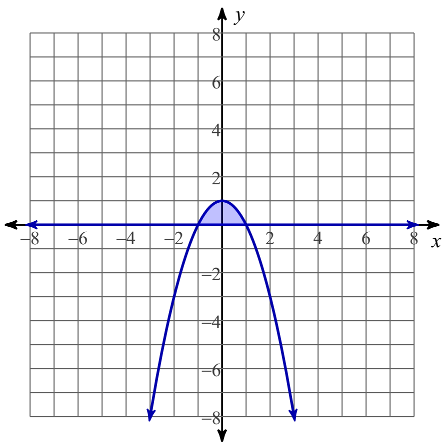


For each problem, find the volume of the specified solid. Set up, but do not evaluate the integral. A graph representing the base is provided.

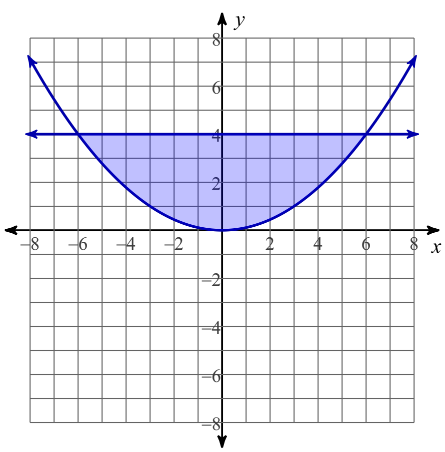
15) The base of a solid is the region enclosed by $y = -\frac{x^2}{9} + 4$ and $y = 0$. Cross-sections perpendicular to the x-axis are rectangles with heights half that of the side in the xy-plane.



16) The base of a solid is the region enclosed by $y = -x^2 + 1$ and $y = 0$. Cross-sections perpendicular to the x-axis are squares.



17) The base of a solid is the region enclosed by $y = 4$ and $y = \frac{x^2}{9}$. Cross-sections perpendicular to the x-axis are semicircles.



Answers to

1) 46

2) $\frac{77}{15} \approx 5.133$

3) $\frac{35}{2} = 17.5$

4) $\frac{67}{30} \approx 2.233$

5) 4

6) −22

7) $\frac{4(3\sqrt{3} - 2\sqrt{2})}{3} \approx 3.157$

8) $\frac{1}{2} = 0.5$

9) $\frac{2 + \sqrt{2}}{2} \approx 1.707$

10) 1

11) $\int_0^4 \left(3\sqrt{x} - \sqrt{x}\right) dx$
$= \frac{32}{3} \approx 10.667$

12) $\int_{-1}^{1} \left(2x^2 + 1 - \left(x^2 - 2x\right)\right) dx$
$= \frac{8}{3} \approx 2.667$

13) $\pi \int_0^{\frac{\pi}{4}} \sec^2 x \, dx$
$= \pi \approx 3.142$

14) $\pi \int_{-1}^{1} \left(\left(-x^2 + 5\right)^2 - \left(x^2 + 3\right)^2\right) dx$
$= \frac{64}{3}\pi \approx 67.021$

15) $\frac{1}{2}\int_{-6}^{6} \left(-\frac{x^2}{9} + 4\right)^2 dx$

16) $\int_{-1}^{1} \left(-x^2 + 1\right)^2 dx$

17) $\frac{\pi}{8}\int_{-6}^{6} \left(4 - \frac{x^2}{9}\right)^2 dx$