MATH 2414 - Volumes of Solids of Revolution Exercises

The integrals required to determine the following volumes are shown on the reverse side.

1. Find the volume of the solid formed by revolving the following region about the *x*-axis: bounded by $f(x) = \sqrt{\sin x}$, the *x*-axis, $x = 0$, and $x = \pi$
Answer: 2π

2. Find the volume of the solid formed by revolving the following region about the *y*-axis: in Quadrant I bounded by $y = x^2$, the *y*-axis, and $y = 4$
Answer: 8π

3. Find the volume of the solid formed by revolving the following region about the line $y = 1$: bounded by $f(x) = 2 - x^2$ and $g(x) = 1$
Answer: $\dfrac{16\pi}{15}$

4. Find the volume of the solid formed by revolving the following region about the *x*-axis: bounded by $y = \sqrt{x}$ and $y = x^2$
Answer: $\dfrac{3\pi}{10}$

5. A manufacturer drills a hole through the center of a metal sphere of radius 5 inches. The hole has a radius of 3 inches. What is the volume of the resulting solid?
Answer: $\dfrac{256\pi}{3}$

6. Find the volume of the solid generated by revolving the region bounded by the graphs of $y = \sqrt{x}$, $y = 0$, and $x = 4$ about: (a) the *x*-axis, (b) the *y*-axis, (c) the line $x = 4$, and (d) the line $x = 6$.
Answer: (a) 8π (b) $\dfrac{128\pi}{5}$ (c) $\dfrac{256\pi}{15}$ (d) $\dfrac{192\pi}{5}$

7. Find the volume of the solid generated by revolving the region bounded by the graphs of $y = x^2$ and $y = 4x - x^2$ about: (a) the *x*-axis and (b) the line $y = 6$.
Answer: (a) $\dfrac{32\pi}{3}$ (b) $\dfrac{64\pi}{3}$

8. Find the volume of the solid formed by revolving the following region about the *x*-axis: $y = \dfrac{1}{\sqrt{x+1}}$, $y = 0$, $x = 0$, and $x = 3$.
Answer: $\pi \ln 4$

9. Find the volume of the solid formed by revolving the following region about the *x*-axis: $y = e^{-x}$, $y = 0$, $x = 0$, and $x = 1$.
Answer: $\dfrac{\pi}{2}\left(1 - \dfrac{1}{e^2}\right)$

10. Find the volume of the solid formed by revolving the following region about the *y*-axis: $y = 6 - 3x$, $y = 0$, and $x = 0$.
Answer: 8π

Solutions to Volume of Solids of Revolution Exercises

1. $\pi\int_0^{\pi}\left(\sqrt{\sin x}\right)^2 dx$

2. $\pi\int_0^{4}\left(\sqrt{y}\right)^2 dy$

3. $\pi\int_{-1}^{1}\left(2-x^2-1\right)^2 dx$

4. $\pi\int_0^{1}\left[\left(\sqrt{x}\right)^2-\left(x^2\right)^2\right] dx$

5. $\pi\int_{-4}^{4}\left[\left(\sqrt{25-x^2}\right)^2-3^2\right] dx$

6. (a) $\pi\int_0^{4}\left(\sqrt{x}\right)^2 dx$

(b) $\pi\int_0^{2}\left[4^2-\left(y^2\right)^2\right]dx$

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

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

7. (a) $\pi\int_0^{2}\left[\left(4x-x^2\right)^2-\left(x^2\right)^2\right] dx$

(b) $\pi\int_0^{2}\left[\left(6-x^2\right)^2-\left(6-(4x-x^2)\right)^2\right]dx$

8. $\pi\int_0^{3}\left(\frac{1}{\sqrt{x+1}}\right)^2 dx$

9. $\pi\int_0^{1}\left(e^{-x}\right)^2 dx$

10. $\pi\int_0^{6}\left(\frac{6-y}{3}\right)^2 dy$