

Finding the Volume of a Solid of Revolution

Set up, but do not integrate or evaluate, the integral which represents the volume of the solid of revolution generated by revolving the region bounded by the given lines and curves about the given axis of revolution. In each case, decide whether the cross-section is a disk or a washer. If it is a disk, first write an expression for the radius; if it is a washer, first write expressions for the outer and inner radii.

Answers

1. $y = x^3, y = 0, x = 2$; about the x-axis.

1. $\pi \int_0^2 x^6 dx$

2. same region; about the line $y = 8$.

2. $\pi \int_0^2 [64 - (8 - x^3)]^2 dx$

3. same region; about the line $y = -1$.

3. $\pi \int_0^2 [(x^3 + 1)^2 - 1] dx$

4. same region; about the y-axis.

4. $\pi \int_0^8 [4 - y^{2/3}] dy$

5. same region; about the line $x = 2$.

5. $\pi \int_0^8 (2 - y^{1/3})^2 dy$

6. same region; about the line $x = 4$.

6. $\pi \int_0^8 [(4 - y^{1/3})^2 - 4] dy$

7. same region; about the line $x = -2$.

7. $\pi \int_0^8 [16 - (y^{1/3} + 2)^2] dy$

8. $y = x^2 + 1, y = x + 3$; about the x-axis.

8. $\pi \int_{-1}^2 [(x + 3)^2 - (x^2 + 1)^2] dx$

9. same region; about the line $y = 7$.

9. $\pi \int_{-1}^2 [(6 - x^2)^2 - (4 - x)^2] dx$