Volume: Disk/Washer

Sources

Calculus: Early Transcendentals 9th Edition

1. 6.2 Exercise 12
2. 6.2 Exercise 15
3. 6.2 Exercise 1

Problems

Evaluate the volume of the solid generated by revolving the region bounded by the given equations about the specified line using the disk/washer method.

1. $y = 0 \quad y = \dfrac{1}{x} \quad x = 1 \quad x = 4$ about $y = 0$

2. $y = \dfrac{x^2}{4} \quad y = 9 \quad x = 0$ about $x = 0$

3. $y = 0 \quad y = x^2 + 5 \quad x = 0 \quad x = 3$ about $y = 0$

Solutions

1.

$$V = \pi \int_1^4 \left(\frac{1}{x}\right)^2 \mathrm{d}x = \pi \left[-\frac{1}{x}\right]_1^4 = \pi \left[-\frac{1}{4} - \left(-\frac{1}{1}\right)\right] = \frac{3\pi}{4}$$

2.

$$y = \frac{x^2}{4} \implies x = 2\sqrt{y}$$
$$y_1 = 2\sqrt{0} = 0$$
$$V = \pi \int_0^9 (2\sqrt{y})^2 \,\mathrm{d}y = \pi \left[2y^2\right]_0^9 = 2(81)\pi = 162\pi$$

3.

$$V = \pi \int_0^3 \left(x^2+5\right)^2 \mathrm{d}x = \pi \int_0^3 \left[x^4 + 10x^2 + 25\right] \mathrm{d}x = \pi \left[\frac{x^5}{5} + \frac{10x^3}{3} + 25x\right]_0^3$$
$$= \pi \left[\frac{3^5}{5} + \frac{10(3)^3}{3} + 25(3) - (0)\right] = \pi \left[\frac{243}{5} + 90 + 75\right] = \frac{\pi(243+825)}{5} = \frac{1068\pi}{5}$$

Indeterminate Powers (Type 3)

Sources

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Evaluate the following limits.

1. $$\lim_{x \to 0^+}$$

Problems

1.

Solutions