

1. Find the volume generated when the plane regions bounded by the given curves and lines are rotated about the x -axis.

(a) $y = \sin x$, $y = 0$, $0 \leq x \leq \pi$ (b) $y = x^2 + 1$, $y = x + 3$ (c) $y = x^3 + 1$, $y = 0$, $x = 2$

(d) $x = 2y - y^2$, $x = 0$ (e) $y = 3x - x^2$, $y = x$ (f) $y = x - x^2$, $y = 0$ (g) $y = 4 - x^2$, $y = 2 - x$

(h) $x = y - y^3$, $x = 0$ (in the first quadrant) (i) $x = y - y^3$, $x = 1$, $y = 1$ (in the first quadrant)

(j) $y = x^3$, $4x = y$ (in the first quadrant) (k) $y = \sqrt{x}$, $y = \frac{x^2}{8}$ (in the first quadrant)

(l) $y = x(a - x)$, $(a > 0)$ $y = 0$ (m) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (n) $y = \sin^2 x$, $0 \leq x \leq \pi$

2. Find the volume generated when the plane regions bounded by the given curves and lines are rotated about the y -axis.

(a) $y = \frac{x}{2}$, $y = 2$, $x = 0$ (b) $x = \sqrt{4 - y^2}$, $y = 0$, $x = 0$ (c) $xy = 1$, $y = 3$, $x = 0$

(d) $y = \tan x$, $x = \frac{\pi}{3}$ (in the first quadrant) (e) $y = \sqrt{x}$, $x = 0$, $y = 2$

(f) $y = x^4$, $y = 0$, $x = 1$ (g) $y = x^3$, $y = 0$, $x = 2$ (h) $y = 8x^2(1 - x)$, $0 \leq x \leq 1$, $y = 0$

(i) $y = 2x^2$, $y = x^2(x^2 - 2)$

3. Find the volume of the the area bounded by the curve $y = x^2$, $y = 4$ when rotated as follows:

about the (a) y -axis (b) x -axis (c) line $y = 4$ (d) line $y = -1$ (e) line $x = 2$

4. Find the volume of the the area bounded by the curves and the lines:

(a) $y = x + x^2$, $y = x^2 - 1$, $x = 0$ rotated about the line $y = 1$

(b) $y = 4x - x^2$, $y = 0$ rotated about the line $y = 4$

(c) $y = 1 - x^2$, $y = -3$ rotated about the line $y = -3$

(d) $y = x^3$, $y = -1$, $x = 1$ rotated about the line $y = 2$

(e) $2x = 4 - y^2$, $2x = y^2 - 4$ rotated about the line $x = -3$

(f) $x = y^2$, $x = 2 - y^2$ rotated about the line $x = -1$