

Volume for Solid of Revolution

Revolve a curve (region) about the x-axis or y-axis to create a solid and determine its volume

Disk Method

Revolve the function $y = f(x)$ about the x-axis over $a \leq x \leq b$

$$V = \pi \int_a^b r^2(x) dx = \pi \int_a^b [f(x)]^2 dx$$

Revolve the function $y = f(x)$ about the y-axis over $c \leq x \leq d$

$$V = \pi \int_c^d r^2(y) dy = \pi \int_c^d [g(y)]^2 dy$$

Washer Method

Revolve two curves about the x-axis over $a \leq x \leq b$

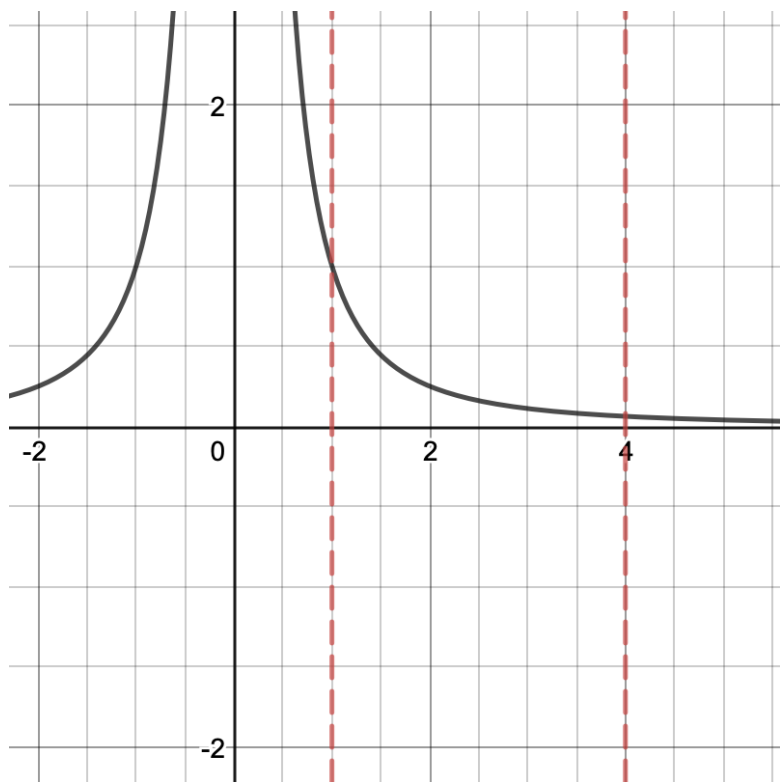
$$V = \pi \int_a^b (r_{outer}^2 - r_{inner}^2) dx = \pi \int_a^b [(f_{outer}(x))^2 - (f_{inner}(x))^2] dx$$

Revolve the function $y = f(x)$ about the y-axis over $c \leq x \leq d$

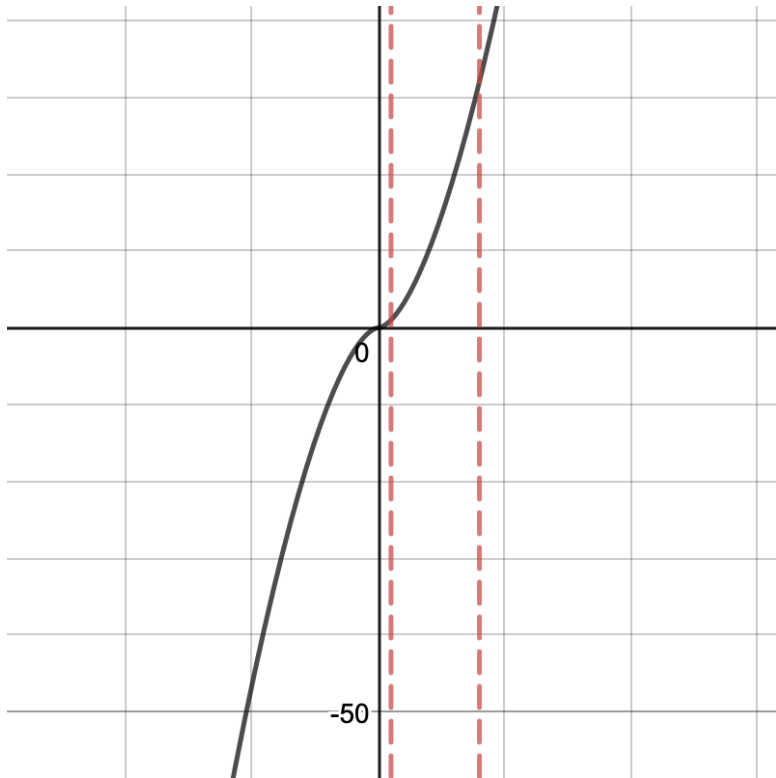
$$V = \pi \int_c^d (r_{outer}^2 - r_{inner}^2) dy = \pi \int_c^d [(g_{outer}(y))^2 - (g_{inner}(y))^2] dy$$

Determine the volume of the solid by revolving the function $f(x)$ about the **x-axis** over the indicated interval.

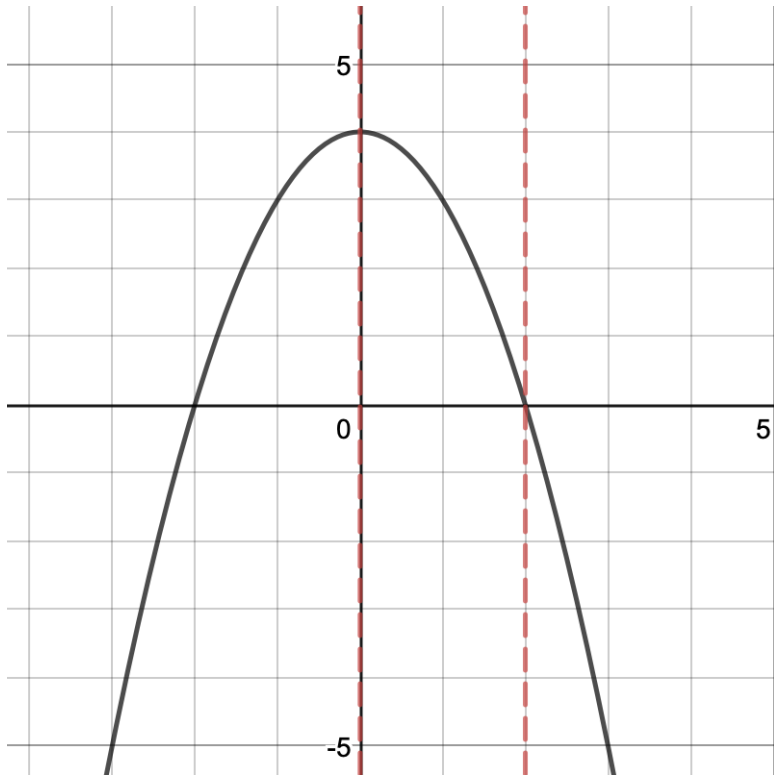
1. $f(x) = \frac{1}{x^2}$ over $1 \leq x \leq 4$



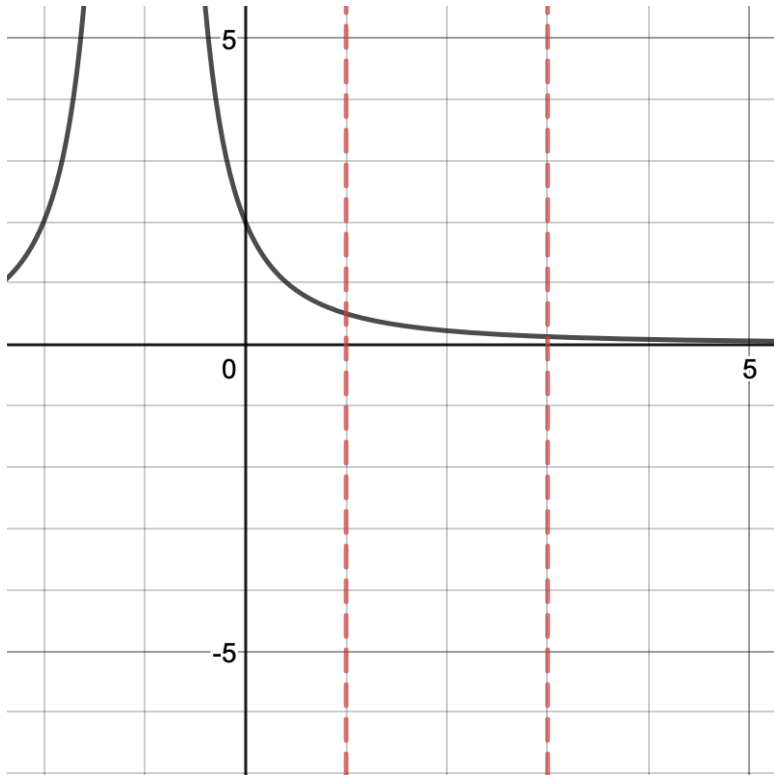
2. $f(x) = x^{5/3}$ over $1 \leq x \leq 8$



3. $f(x) = 4 - x^2$ over $0 \leq x \leq 2$

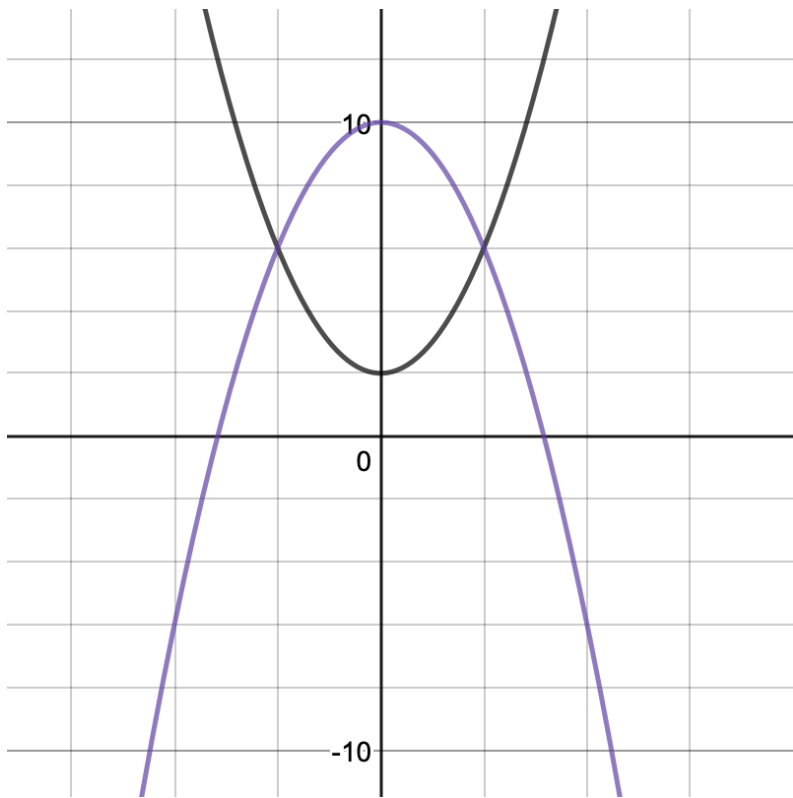


4. $f(x) = \frac{2}{(x+1)^2}$ over $1 \leq x \leq 3$

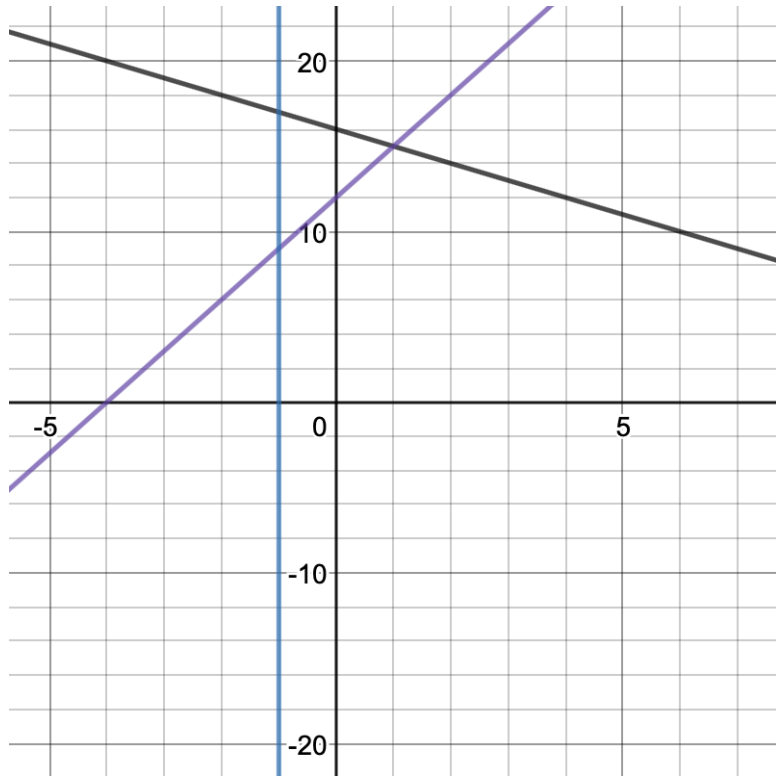


Find the volume of the solid obtained by rotating the region about the **x-axis**

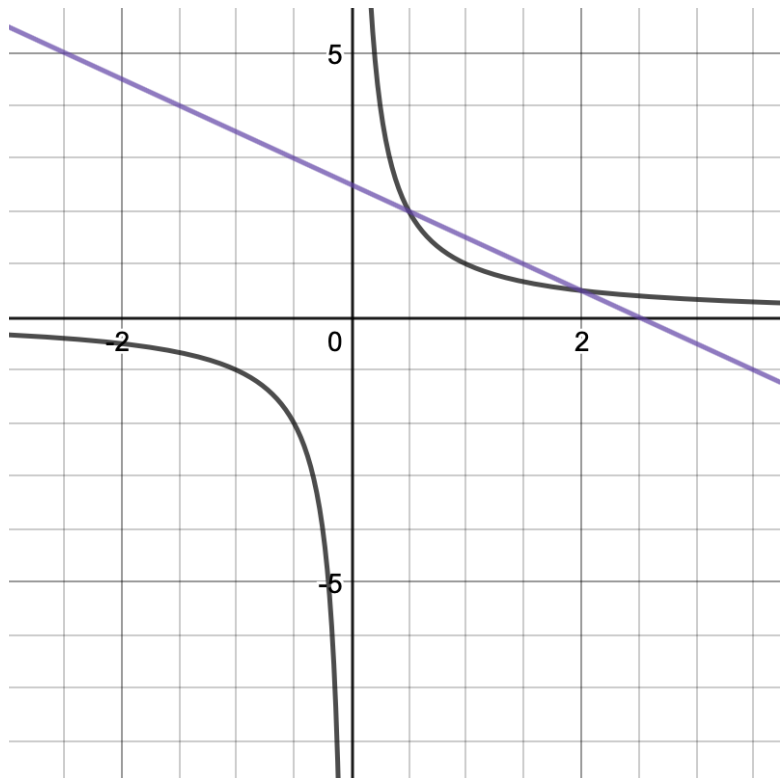
5. $y = x^2 + 2, y = 10 - x^2$



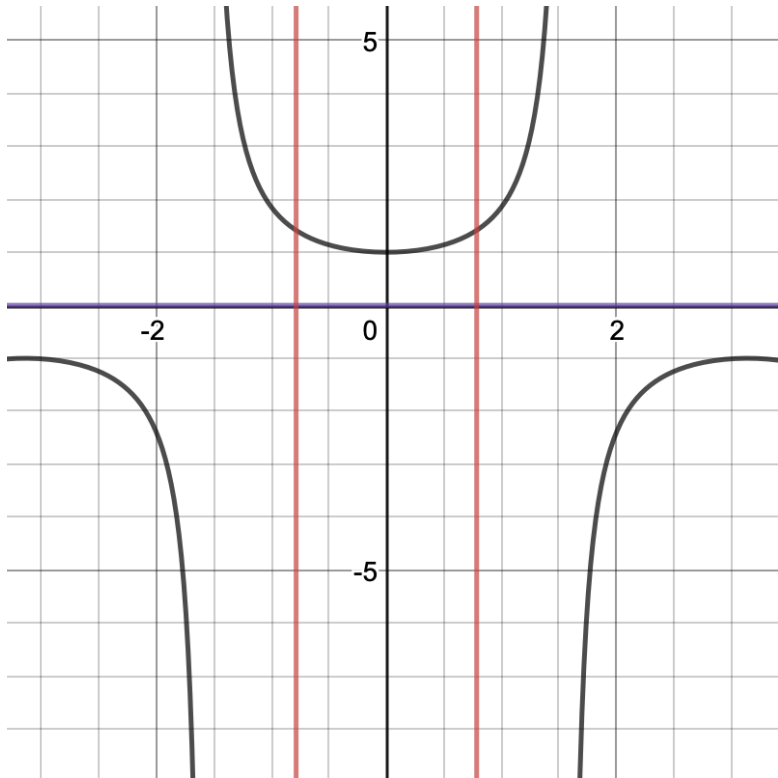
6. $y = 16 - x, y = 3x + 12, x = -1$



7. $y = \frac{1}{x}, y = \frac{5}{2} - x$

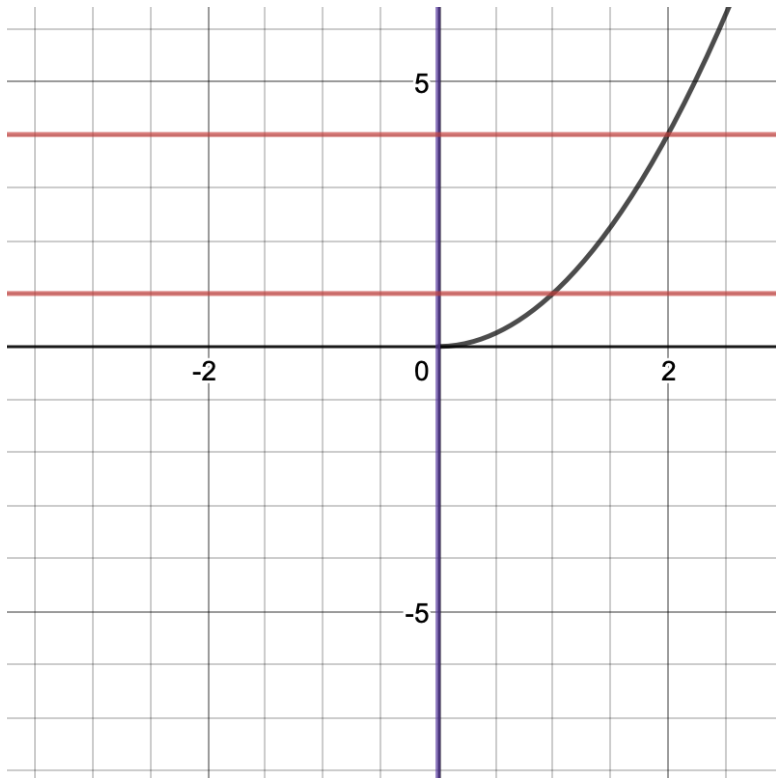


8. $y = \sec(x)$, $y = 0$, $x = -\frac{\pi}{4}$, $x = \frac{\pi}{4}$

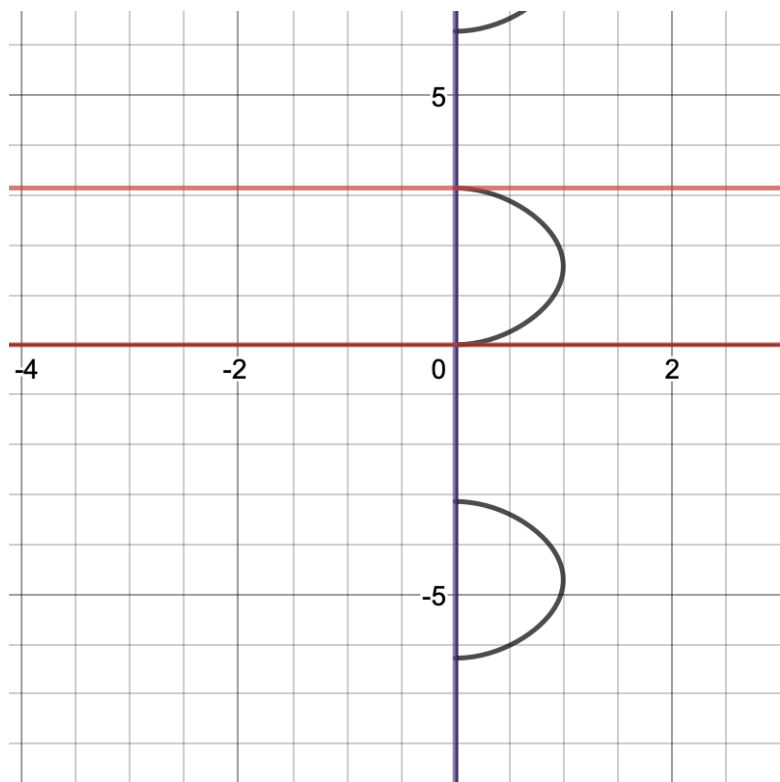


Determine the volume of the solid by revolving the function $f(x)$ about the **y-axis** over the indicated interval.

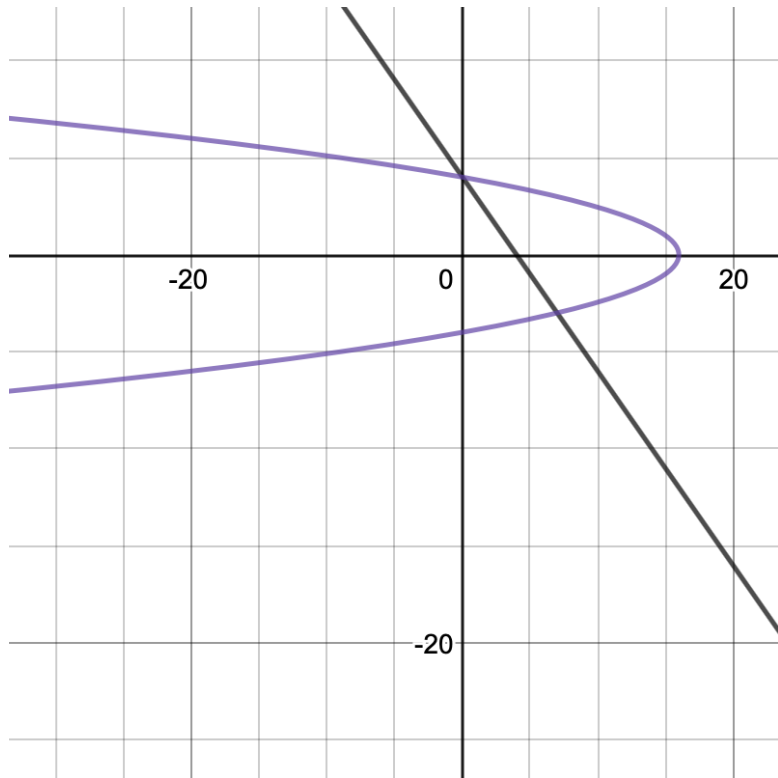
9. $x = \sqrt{y}$, $x = 0$, $1 \leq y \leq 4$



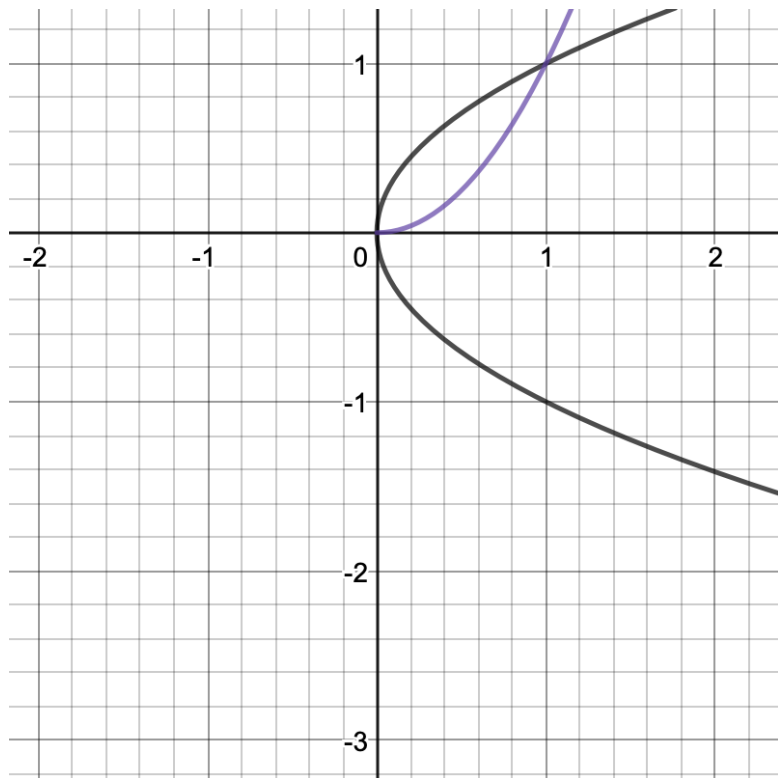
10. $x = \sqrt{\sin(y)}$, $x = 0$, $0 \leq y \leq \pi$



11. $x = 4 - y$, $x = 16 - y^2$

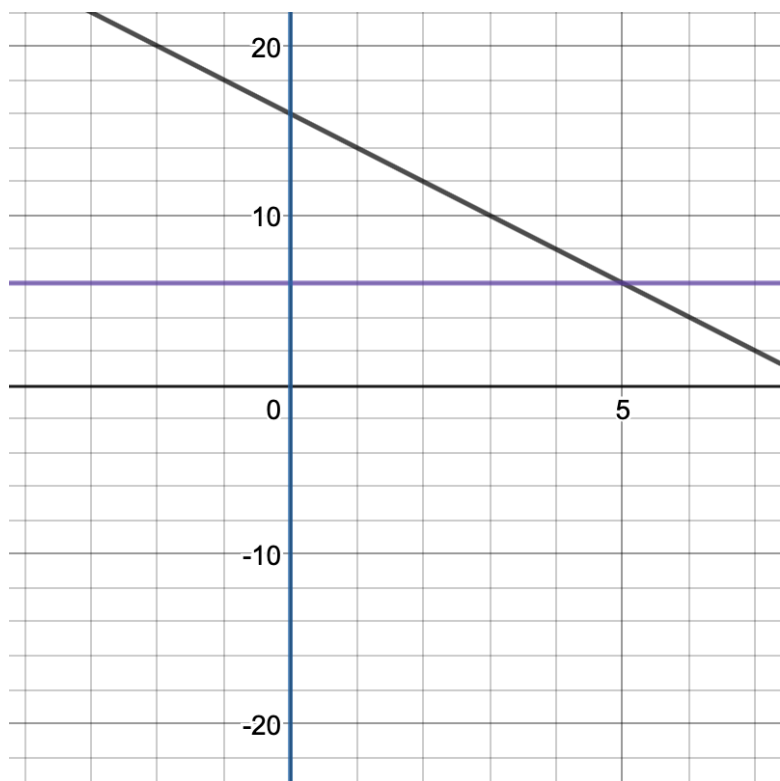


12. $x = y^2$, $x = \sqrt{y}$

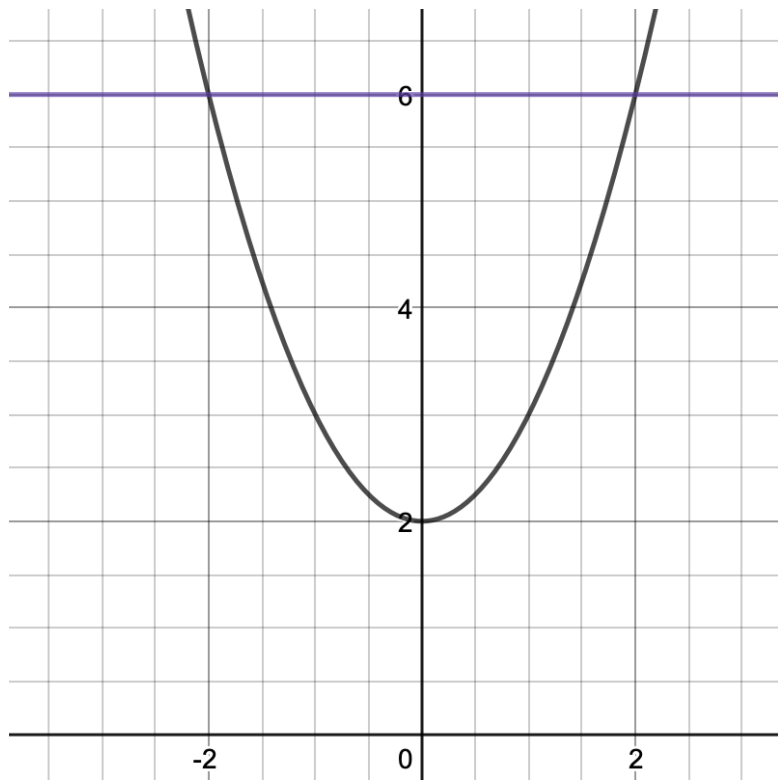


Find the volume of the solid by rotating the region bounded by the curves about the indicated axis.

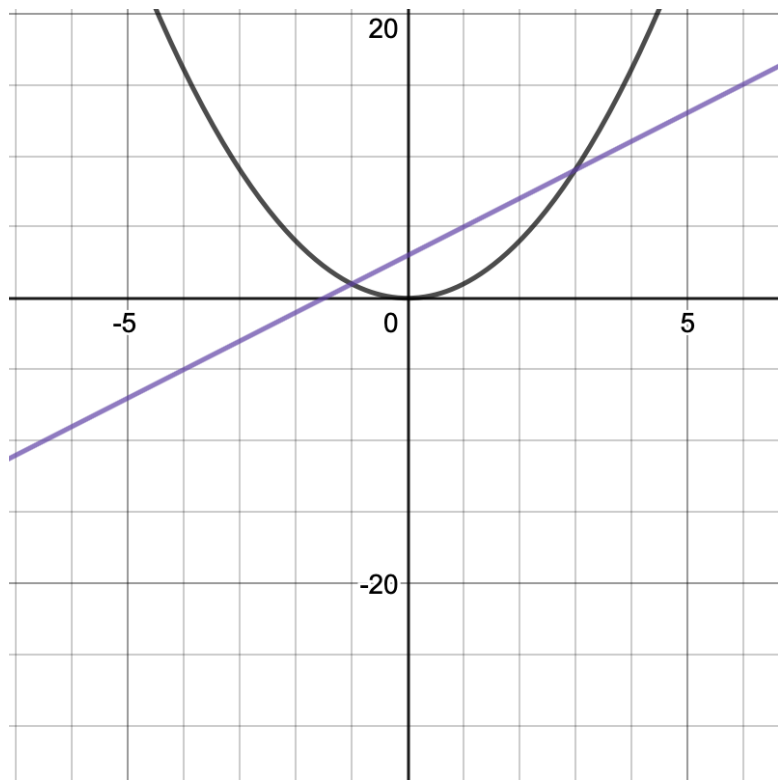
13. $y = 16 - 2x$, $y = 6$, $x = 0$ about the **x-axis**



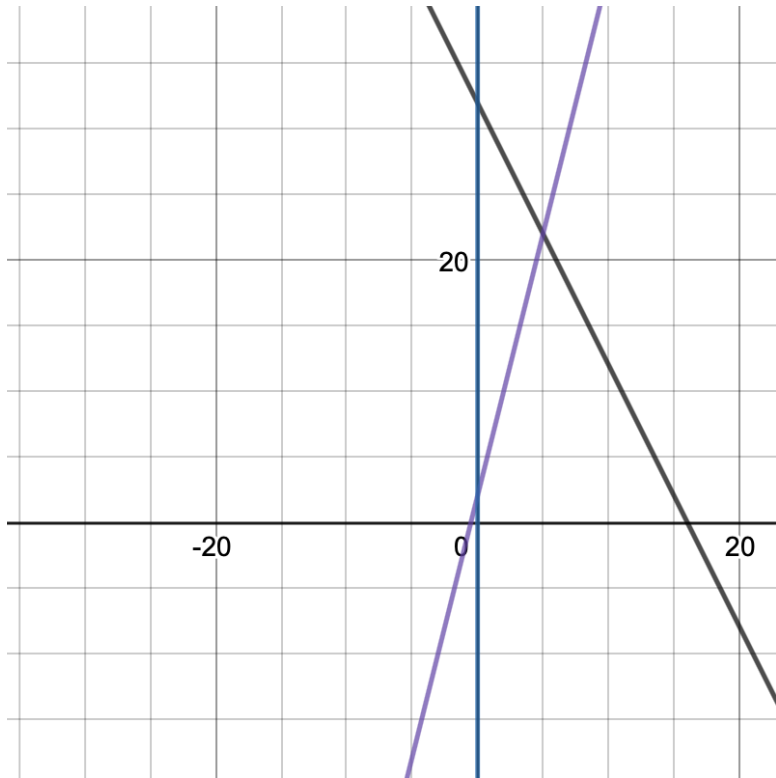
14. $y = x^2 + 2, y = 6$ about the **x-axis**



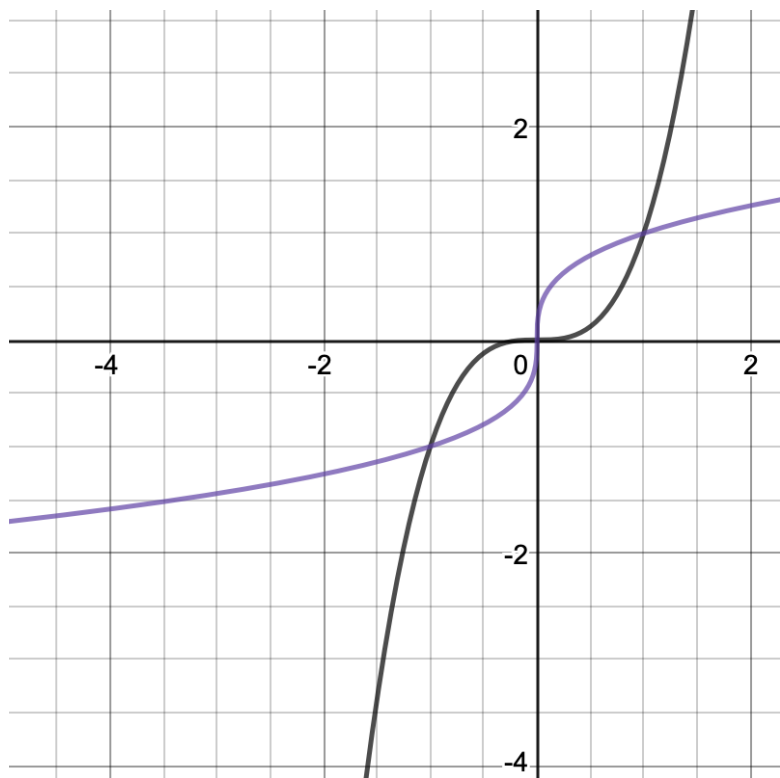
15. $y = x^2$, $y = 2x + 3$ about the **x-axis**



16. $y = 32 - 2x$, $y = 2 + 4x$, $x = 0$ about the **y-axis**



17. $y = x^3, y = \sqrt[3]{x}, x \geq 0$ about the **y-axis**



18. $y = \frac{1}{x}$, $y = \frac{5}{2} - x$ about the **y-axis**

