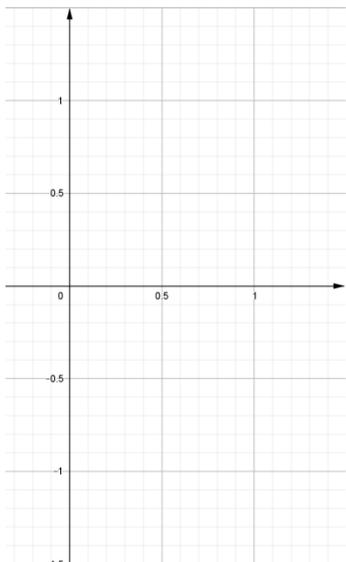
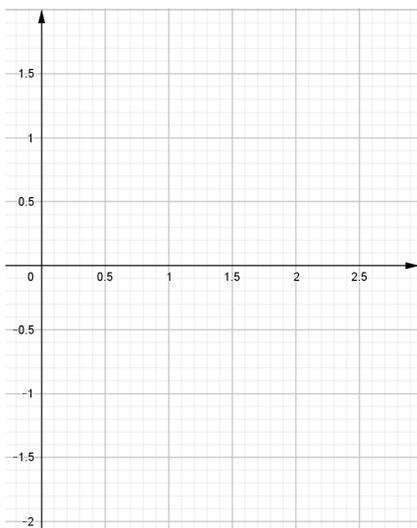


Find the volume of the solid obtained by the rotating the region bounded by the given curves about the specified line. Sketch the region, the solid, and a typical disk or washer.

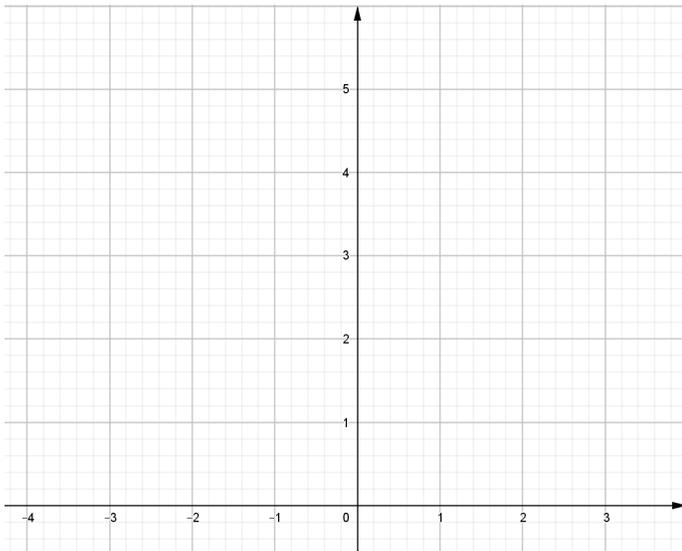
1) $y = x^2$, $x = 1$, $y = 0$ | about the x -axis



2) $y = \frac{1}{x}$, $x = 1$, $x = 2$, $y = 0$ | about the x -axis



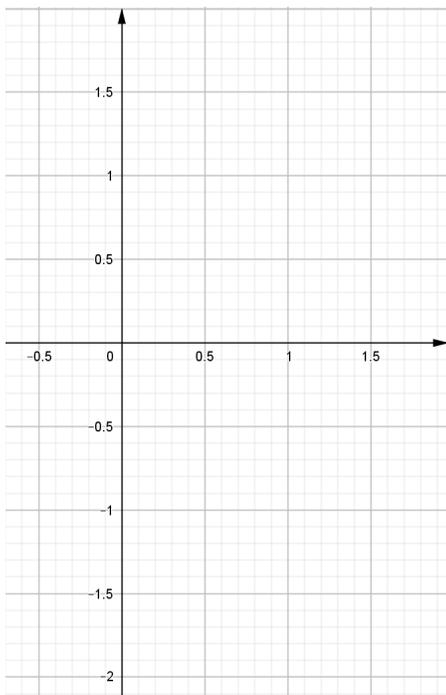
3) $y = x^2$, $0 \leq x \leq 2$, $y = 4$, $x = 0$ | about the y -axis



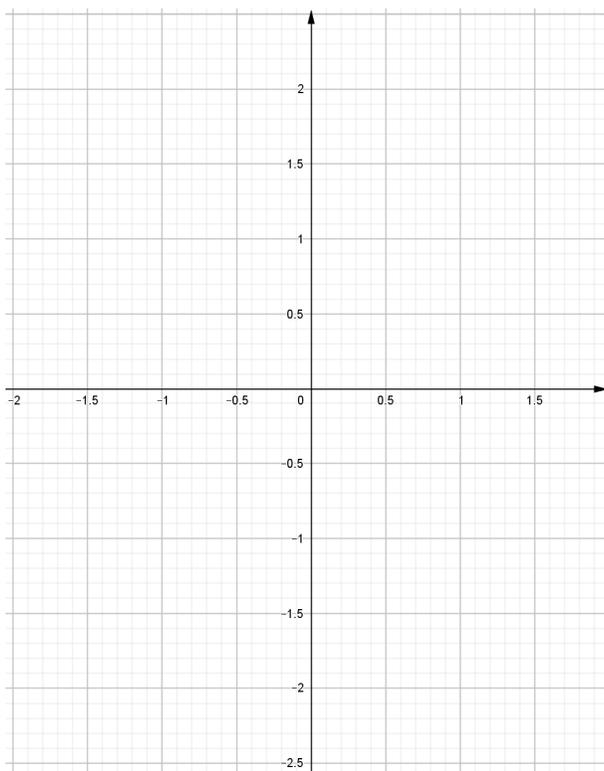
4) $x = y - y^2$, $x = 0$ | about the y -axis



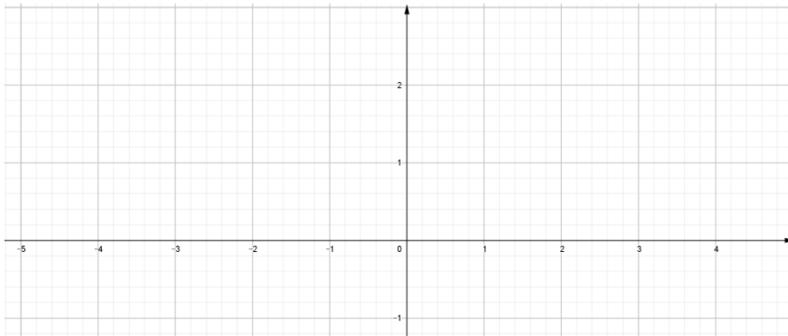
5) $y = x^2$, $y^2 = x$ | about the x -axis



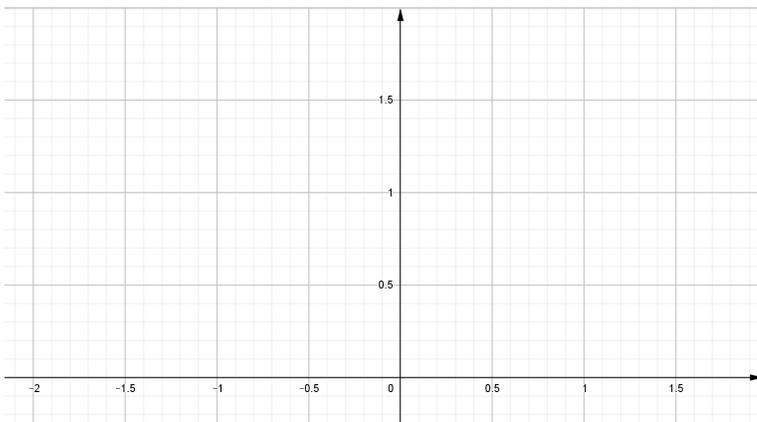
6) $y = \sec x$, $y = 1$, $x = -1$, $x = 1$ | about the x -axis



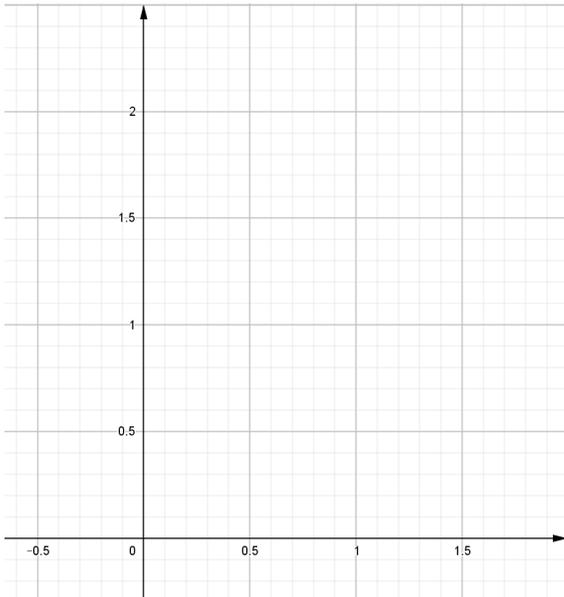
7) $y^2 = x$, $x = 2y$ | about the y -axis



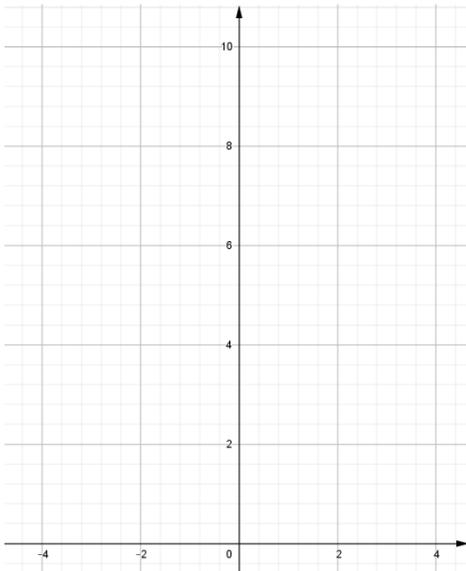
8) $y = x^{\frac{2}{3}}$, $x = 1$, $y = 0$ | about the y -axis



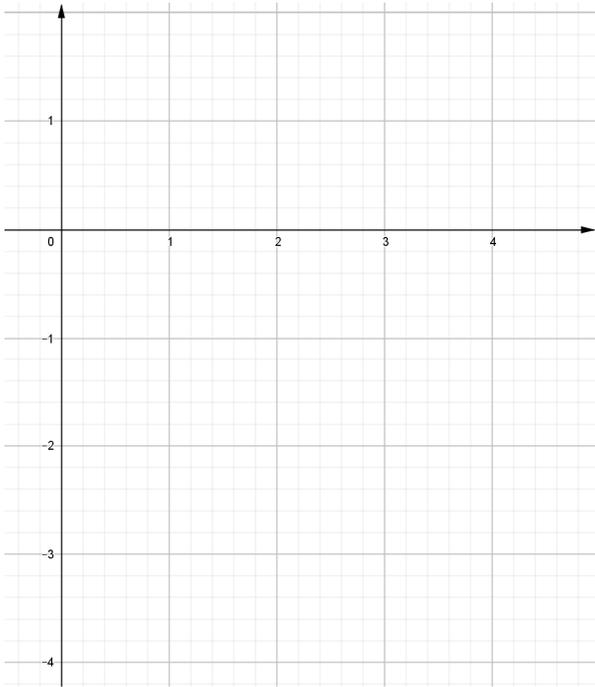
9) $y = x$, $y = \sqrt{x}$ | about $y = 1$



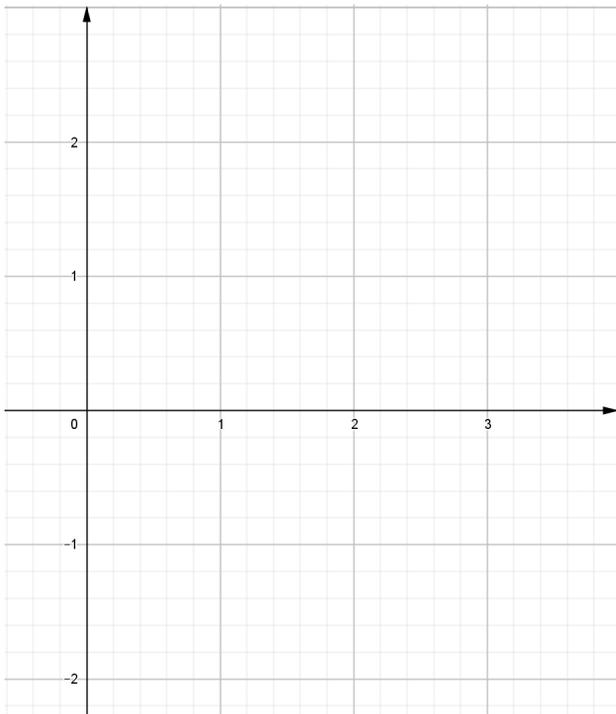
10) $y = x^2$, $y = 4$ | about $y = 4$



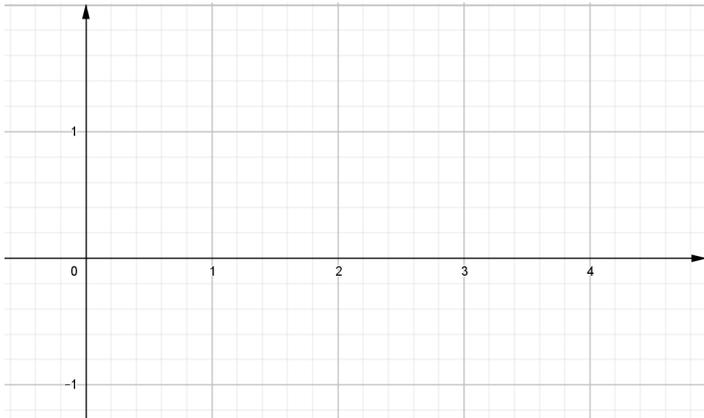
11) $y = \frac{1}{x}$, $y = 0$, $x = 1$, $x = 3$ | about $y = -1$



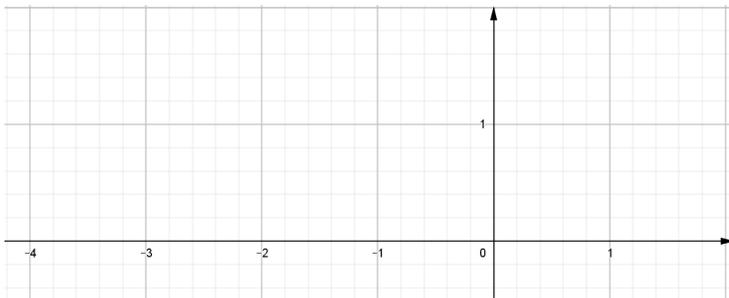
12) $x = y^2$, $x = 1$ | about $x = 1$



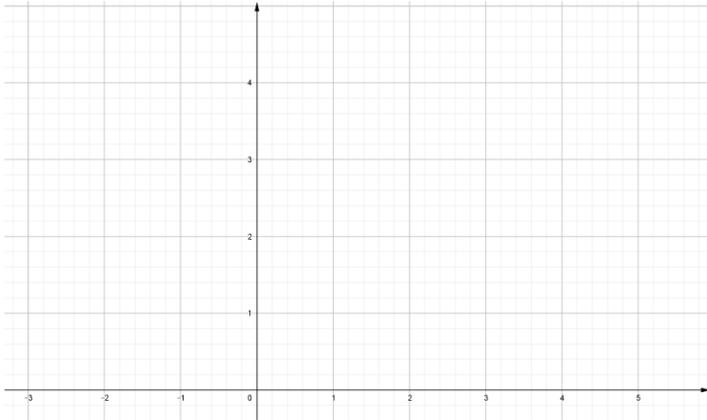
13) $y = x$, $y = \sqrt{x}$ | about $x = 2$



14) $y = x^2$, $x = y^2$ | about $x = -1$



15) $y = x$, $y = 0$, $x = 2$, $x = 4$ | about $x = 1$



Set up, but do not evaluate, and integral for the volume of the solid obtained by rotating the region bounded by the given curves about the specified line.

16) $y = \tan^3 x$, $y = 1$, $x = 0$ | about $y = 1$

17) $y = (x - 2)^4$, $8x - y = 16$ | about $x = 10$

18) $y = 0$, $y = \sin x$, $0 \leq x \leq \pi$ | about $y = -2$

19) $x^2 - y^2 = 1$, $x = 3$ | about $x = -2$

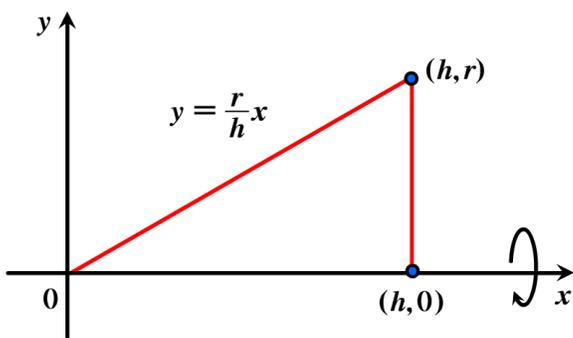
20) Use a graph to find approximate x -coordinates of the points of intersection of the given curves. Then find (approximately) the volume of the solid obtained by rotating about the x -axis the region bounded by these curves.

$$y = 3\sin(x^2), \quad y = e^{\frac{x}{2}} + e^{-2x}$$

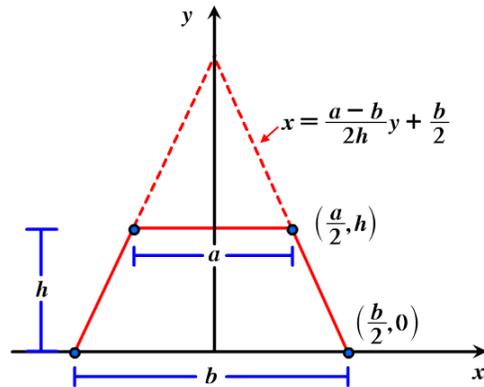
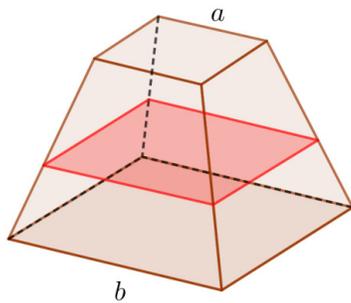
- 21) A CAT scan produces equally spaced cross-sectional views of a human organ that provide information about the organ otherwise obtained only by surgery. Suppose that a CAT scan of a human liver shows cross-sections spaced 1.5 cm apart. The liver is 15 cm long and the cross-sectional areas, in square centimeters, are 0, 18, 58, 79, 94, 106, 117, 128, 63, 39, and 0. Use the Midpoint Rule to estimate the volume of the liver.

Find the volume of the described solid S .

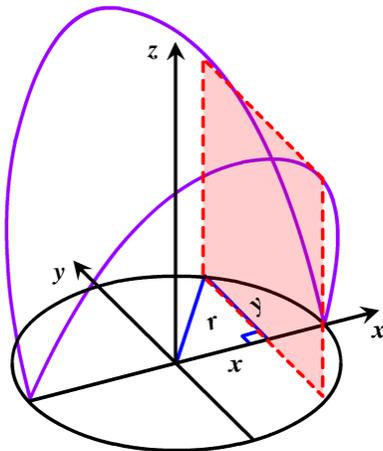
- 22) A right circular cone with height h and base radius r . Use the following diagram to find the volume by using calculus.



23) A frustum of a pyramid with square base of side b , square top of side a , and height h . What happens if $a = b$? What happens if $a = 0$? Use the following diagram to find the volume by using calculus.



24) The base S is a circular disk with radius r . Parallel cross-sections perpendicular to the base are squares. Use the following diagram to find the volume by using calculus.



- 25) The base of S is an elliptical region with boundary curve $9x^2 + 4y^2 = 36$. Cross-sections perpendicular to the x -axis are isosceles right triangles with hypotenuse in the base.
- 26) The base of S is the parabolic region $\{(x, y) \mid x^2 \leq y \leq 1\}$. Cross-sections perpendicular to the y -axis are equilateral triangles.
- 27) Find the volume common to two spheres, each with radius r , if the center of each sphere lies on the surface of the other sphere.