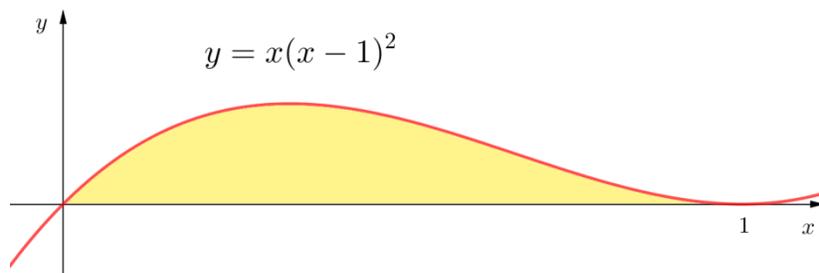


- 1) Let S be the solid obtained by rotating the region shown in the figure about the y -axis. Explain why it is awkward to use slicing to find the volume V of S . Sketch a typical approximating shell. What are its circumference and height? Use shells to find V .

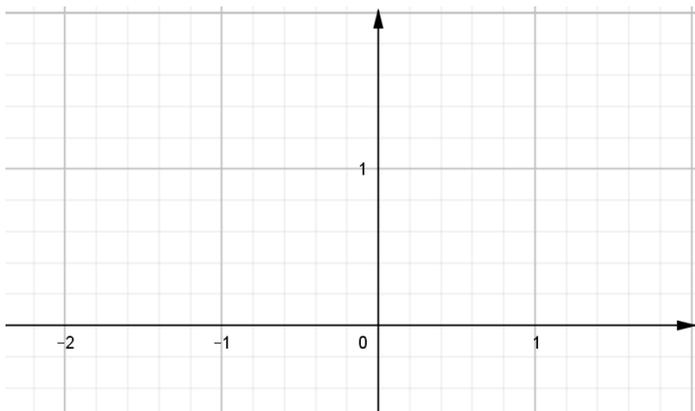


Use the method of cylindrical shells to find the volume generated by rotating the region bounded by the given curves about the y -axis. Sketch the region and a typical shell.

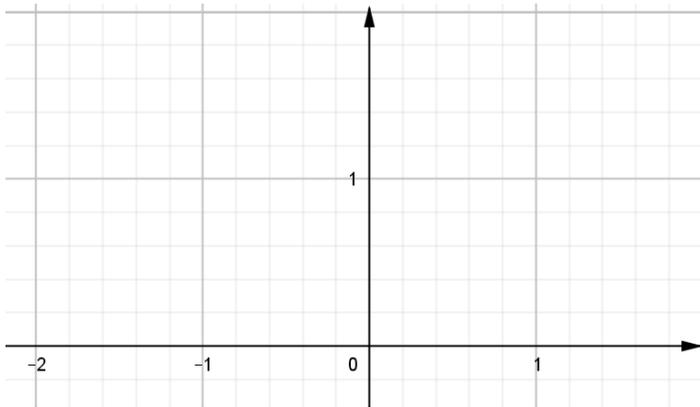
2) $y = \frac{1}{x}$, $y = 0$, $x = 1$, $x = 2$



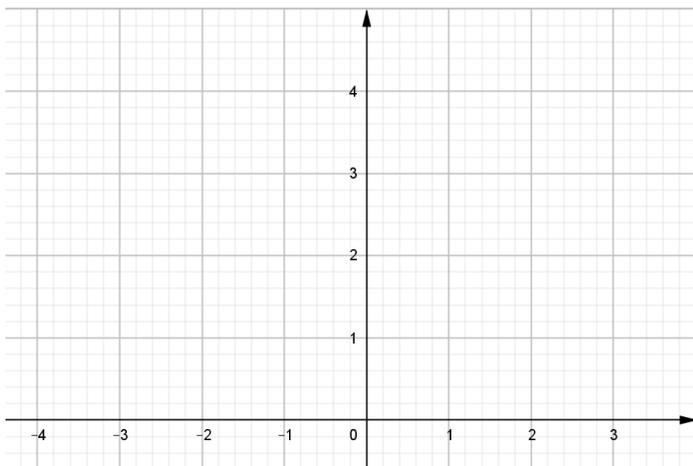
3) $y = x^2$, $y = 0$, $x = 1$



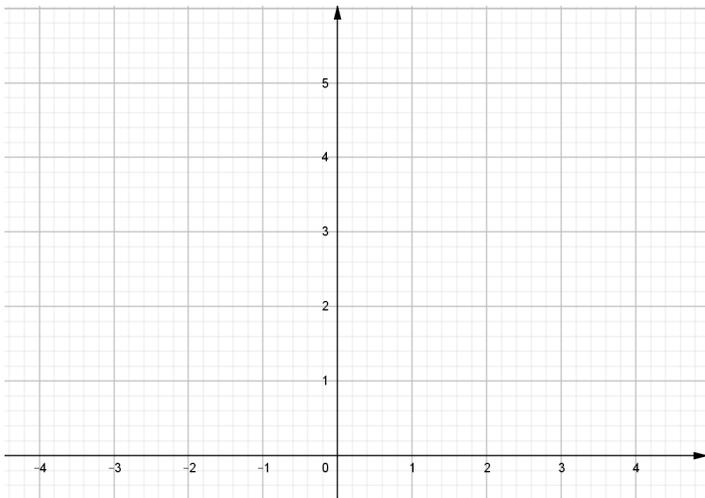
4) $y = e^{-x^2}$, $y = 0$, $x = 0$, $x = 1$



5) $y = 3 + 2x - x^2$, $x + y = 3$

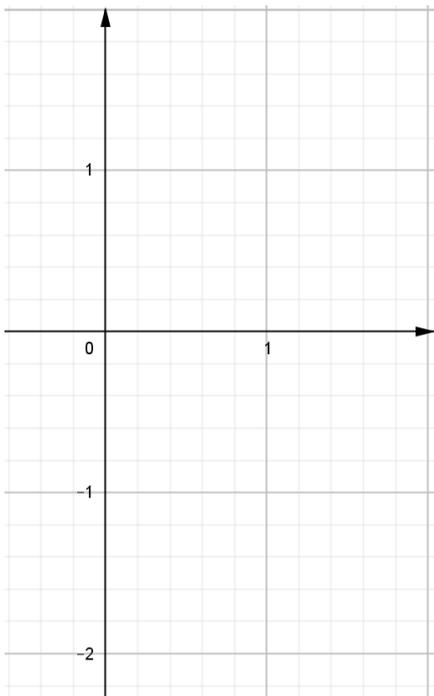


6) $y = 4(x-2)^2$, $y = x^2 - 4x + 7$

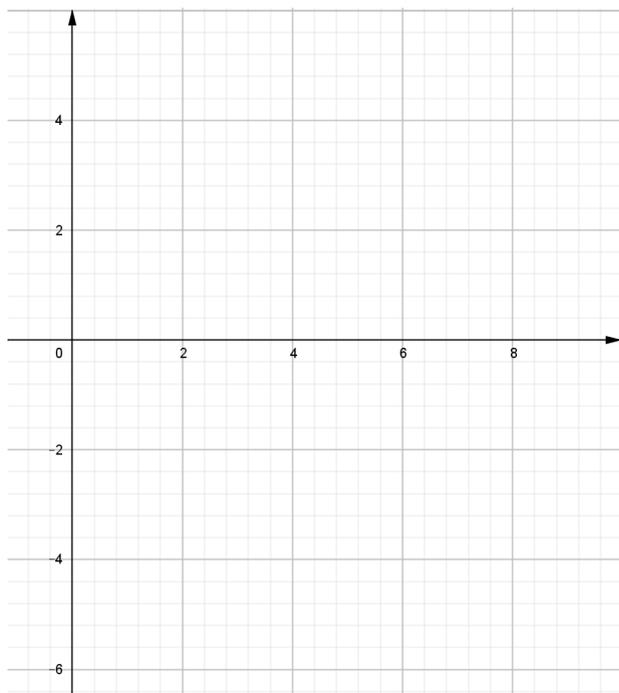


Use the method of cylindrical shells to find the volume of the solid obtained by rotating the region bounded by the given curves about the x -axis. Sketch the region and a typical shell.

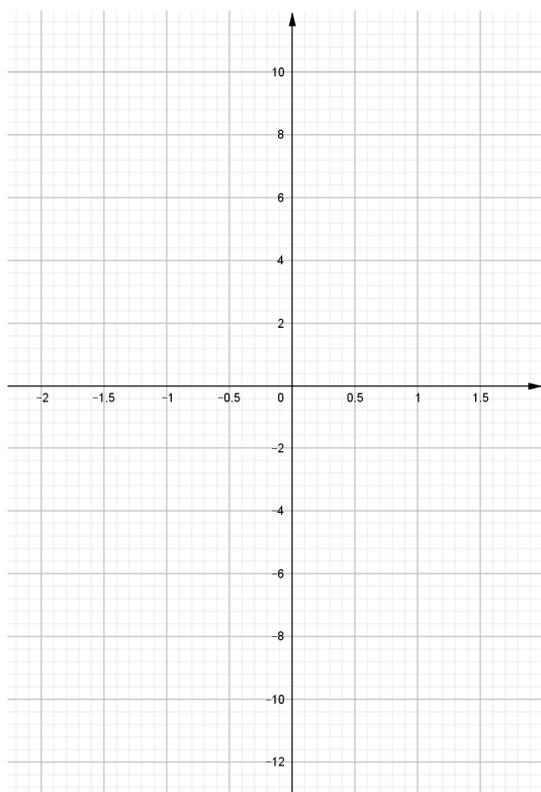
7) $x = \sqrt{y}$, $x = 0$, $y = 1$



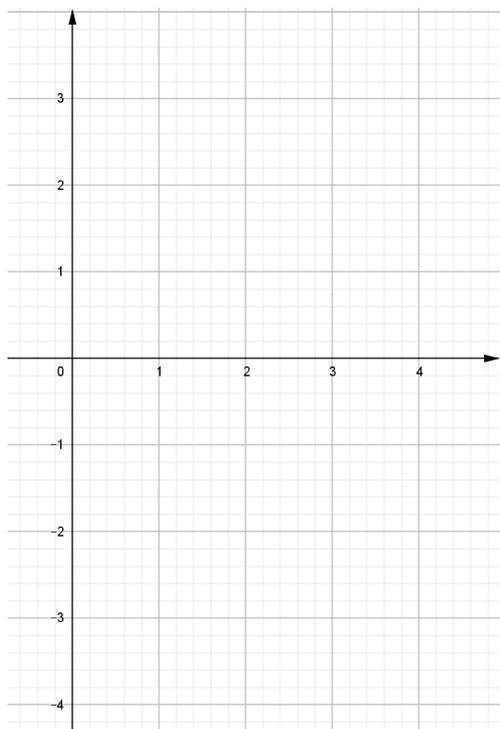
8) $x = 4y^2 - y^3$, $x = 0$



9) $y = 4x^2$, $2x + y = 6$

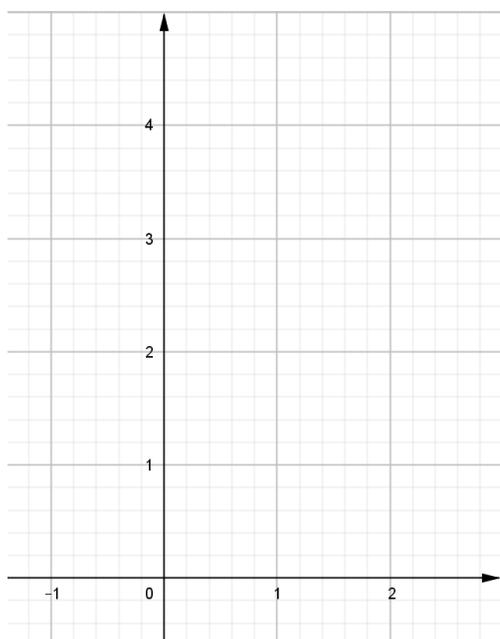


10) $x + y = 3$, $x = 4 - (y - 1)^2$

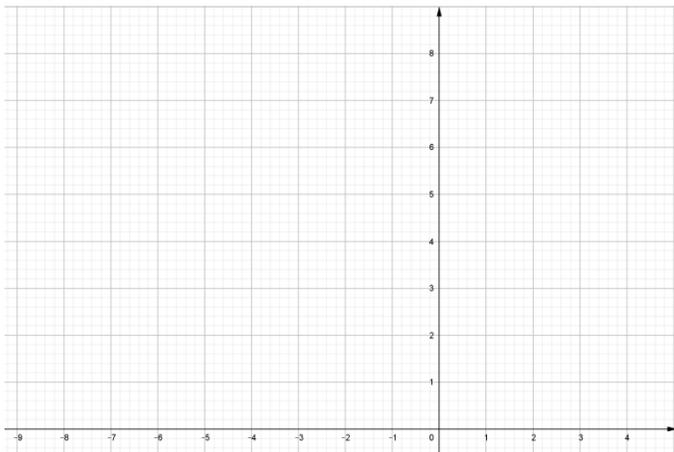


Use the method of cylindrical shells to find the volume generated by rotating the region bonded by the given curves about the specified axis. Sketch the region and a typical shell.

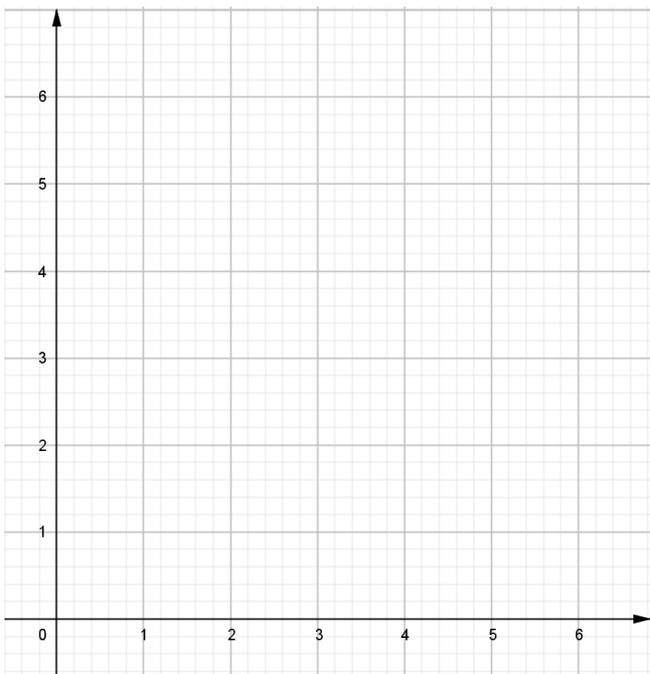
11) $y = x^2$, $y = 0$, $x = 1$, $x = 2$ | about $x = 1$



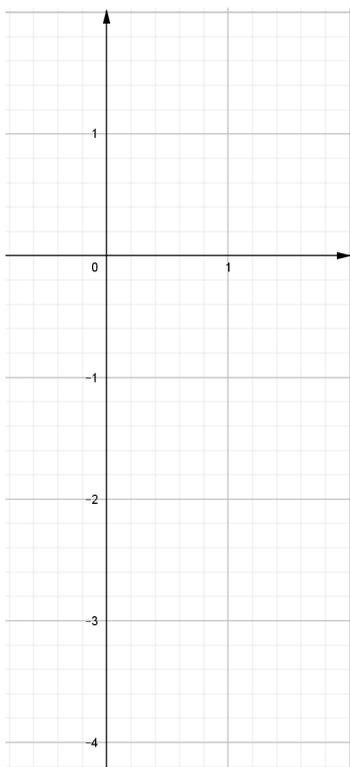
12) $y = 4x - x^2$, $y = 8x - 2x^2$ | about $x = -2$



13) $y = \sqrt{x-1}$, $y = 0$, $x = 5$ | about $y = 3$



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



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

15) $y = x$, $y = 4x - x^2$ | about $x = 7$

16) $x^2 - y^2 = 7$, $x = 4$ | about $y = 5$

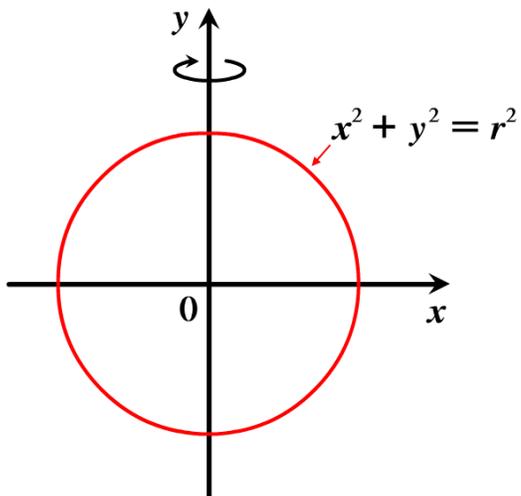
17) Use the Midpoint Rule with $n = 4$ to estimate the volume obtained by rotating about the y -axis the region under the curve $y = \tan x$, $0 \leq x \leq \frac{\pi}{4}$.

18) Use a graph to estimate the x -coordinates of the points of intersection of the given curves. Then use this information to estimate the volume of the solid obtained by rotating about the y -axis the region enclosed by these curves.

$$y = x^4, \quad y = 3x - x^3$$

Use cylindrical shells to find the volume of the solid.

19) A sphere of radius r . Use the following diagram to find the volume by using calculus.



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

