

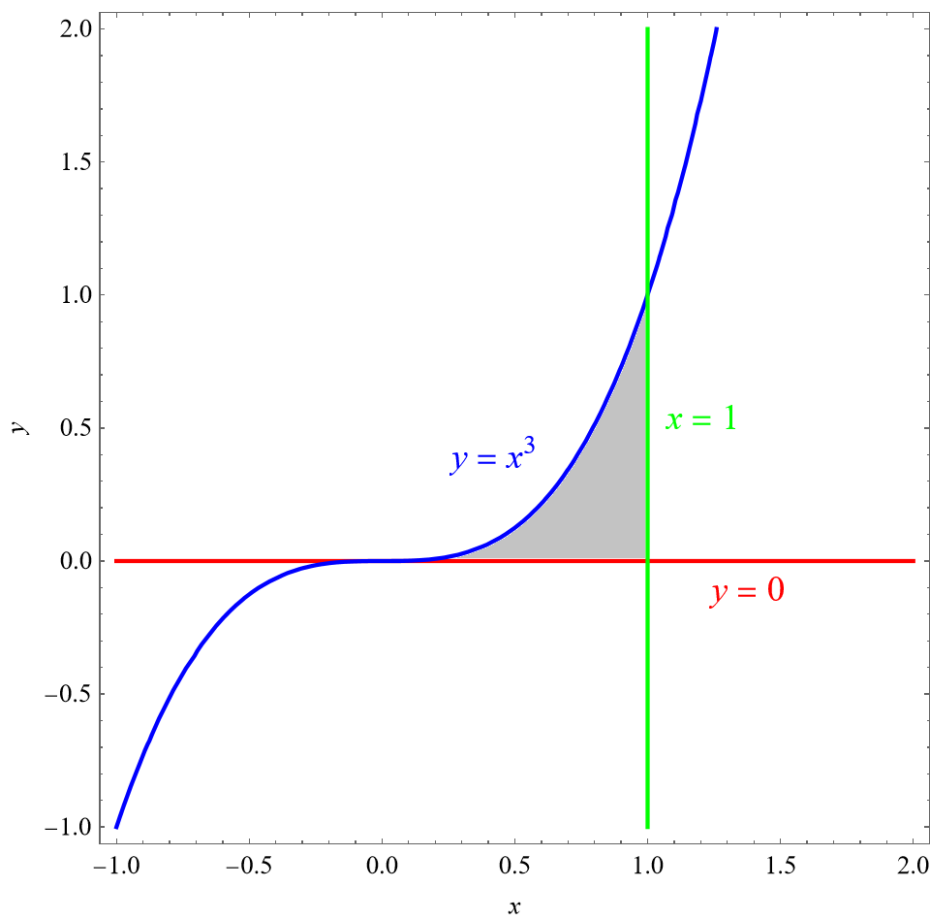
## Exercise 46

Sketch the region enclosed by the given curves and calculate its area.

$$y = x^3, \quad y = 0, \quad x = 1$$

### Solution

Start by drawing the given curves in the  $xy$ -plane and shading the area they enclose.



The shaded area is calculated by integrating the height ( $x^3 - 0$ ) from the lowest value of  $x$  to the highest value of  $x$  that it occupies.

$$\begin{aligned} \text{Area} &= \int_{x_{\min}}^{x_{\max}} \text{Height } dx = \int_0^1 x^3 dx \\ &= \left. \frac{x^4}{4} \right|_0^1 \\ &= \frac{1^4}{4} - \frac{0^4}{4} = \frac{1}{4} \end{aligned}$$