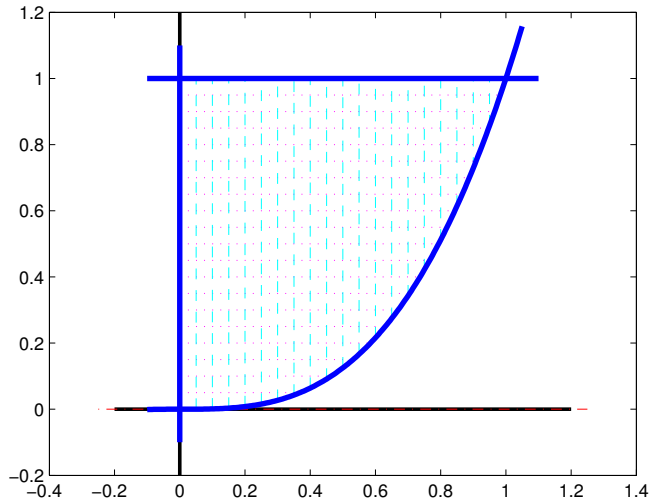


# Quiz #3

## SOLUTION

1. { 12 points } Find the volume of the solid generated when the region enclosed by the given curves is revolved about the  $x$ -axis

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



- (a) Use cylindrical shells

$$\begin{aligned} \text{Volume} &= 2\pi \int_0^1 y y^{\frac{1}{3}} dy = 2\pi \int_0^1 y^{\frac{4}{3}} dy = 2\pi \left. \frac{3}{7} y^{\frac{7}{3}} \right|_0^1 \\ &= 2\pi \frac{3}{7} \left( 1^{\frac{7}{3}} - 0^{\frac{7}{3}} \right) = \frac{6\pi}{7} \end{aligned}$$

- (b) Use slicing (the solid is a washer)

$$\begin{aligned} \text{Volume} &= \pi \int_0^1 1^2 - (x^3)^2 dx = \pi \int_0^1 1 - x^6 dx = \pi \left( x - \frac{1}{7} x^7 \right) \Big|_0^1 \\ &= \pi \left( 1 - \frac{1}{7} \right) = \frac{6\pi}{7} \end{aligned}$$