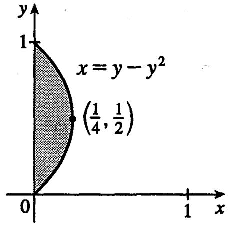
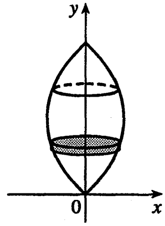
4. A cross-section is a disk with radius $y - y^2$, so its area is $A(y) = \pi\left(y - y^2\right)^2$.

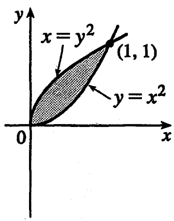
$$V = \int_0^1 A(y)\,dy = \int_0^1 \pi\left(y - y^2\right)^2 dy = \pi \int_0^1 \left(y^4 - 2y^3 + y^2\right) dy = \pi\left[\tfrac{1}{5}y^5 - \tfrac{1}{2}y^4 + \tfrac{1}{3}y^3\right]_0^1$$
$$= \pi\left(\tfrac{1}{5} - \tfrac{1}{2} + \tfrac{1}{3}\right) = \tfrac{\pi}{30}$$

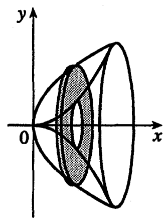




5. A cross-section is a washer (annulus) with inner radius x^2 and outer radius $\sqrt{x}$, so its area is $A(x) = \pi(\sqrt{x}\,)^2 - \pi\left(x^2\right)^2 = \pi\left(x - x^4\right)$.

$$V = \int_0^1 A(x)\,dx = \pi \int_0^1 \left(x - x^4\right) dx = \pi\left[\tfrac{1}{2}x^2 - \tfrac{1}{5}x^5\right]_0^1 = \pi\left(\tfrac{1}{2} - \tfrac{1}{5}\right) = \tfrac{3\pi}{10}$$





6. A cross-section is a washer with inner radius 1 and outer radius $\sec x$, so its area is $A(x) = \pi(\sec x)^2 - \pi(1)^2 = \pi\left(\sec^2 x - 1\right)$.

$$V = \int_{-1}^1 A(x)\,dx = \int_{-1}^1 \pi\left(\sec^2 x - 1\right) dx = 2\pi \int_0^1 \left(\sec^2 x - 1\right) dx = 2\pi\left[\tan x - x\right]_0^1 = 2\pi(\tan 1 - 1)$$
$$\approx 3.5023$$