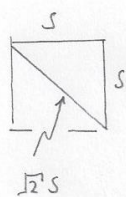
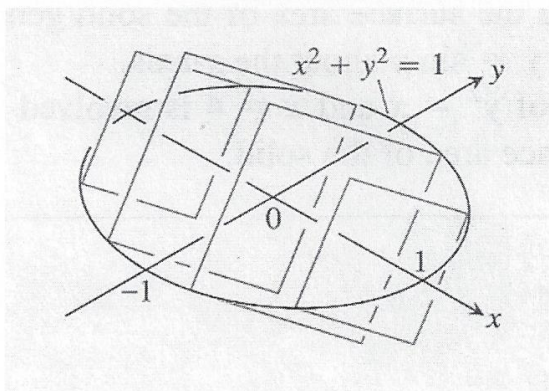


# AP CALCULUS AB

- 1) Find the volume of the solid, whose cross-sections perpendicular to the  $x$ -axis, are squares, with their diagonals running from one side of the circle to the other, as pictured.



$$dV = s^2 dx$$

$$y^2 = 1 - x^2$$

$$\frac{1}{2}(\sqrt{2}s) = y,$$

$$\frac{\sqrt{2}}{2}s = y, \quad \frac{1}{2}s^2 = y^2, \quad s^2 = 2y^2 = 2(1 - x^2)$$

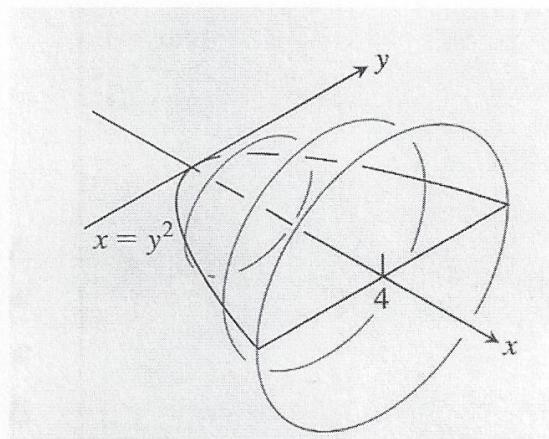
$$dV = 2(1 - x^2) dx$$

$$V = \int dV = 2 \int_{-1}^1 (1 - x^2) dx =$$

$$= 2 \left[ x - \frac{x^3}{3} \right]_{-1}^1 = 2 \left[ 1 - \frac{1}{3} \right] = \frac{8}{3}$$

# PRISMATIC CROSS-SECTIONS

- 2) Find the volume of the solid, whose cross-sections perpendicular to the  $x$ -axis, are circles, with their diameters running from one branch of the parabola to the other, as pictured.



$$dV = \pi r^2 dx, \quad r = y, \quad r^2 = y^2 = x$$

$$dV = \pi x dx, \quad V = \int dV = \pi \int_0^4 x dx =$$

$$= \pi \left[ \frac{x^2}{2} \right]_0^4 = 8\pi$$