Boas 5-3.33 **The integral for the volume is given by equation (3.10) on page 254.**

Doing the y integral first and evaluating at the upper and lower limits for y we get:

$$V = \int_x dx \int_{z=-x^2}^{x^2} \left[2\sqrt{x^4 - z^2}\right] dz$$

From tables

$$V = \int_0^1 dx \cdot 2 \cdot \frac{1}{2}\left[z\sqrt{x^4 - z^2} + x^4 \sin^{-1}\frac{z}{x^2}\right]_{-x^2}^{x^2}$$

$$V = \int_0^1 dx \left[\left(x^2 \underbrace{\sqrt{x^4 - x^4}}_{=0} + x^4 \sin^{-1}\frac{x^2}{x^2}\right) - \left(-x^2 \underbrace{\sqrt{x^4 - x^4}}_{=0} + x^4 \sin^{-1}\frac{-x^2}{x^2}\right)\right]$$

$$= \int_0^1 dx \left[\left(x^4 \underbrace{\sin^{-1} 1}_{=\frac{\pi}{2}}\right) - \left(x^4 \underbrace{\sin^{-1} -1}_{=-\frac{\pi}{2}}\right)\right] = \int_0^1 dx \left[x^4 \left(\frac{\pi}{2}\right) 2\right]$$

$V = \int_0^1 \pi x^4 \, dx$ as obtained before

$$\boxed{V = \frac{\pi}{5}}$$