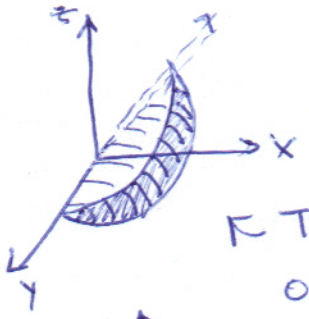
Jonathan Wong

SPRING 07 PROBLEM 2



Bounded by: $x^2+y^2+z^2=4$

$z=x$

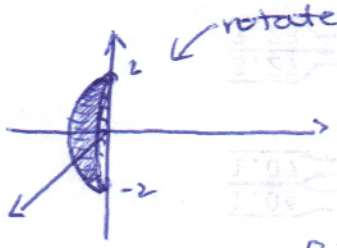
This shape is like a wedge, being $1/8$ of the volume of a sphere so:

$$V_{sphere} = \frac{4}{3}\pi r^3$$

$$r = 2$$

$$\underbrace{\left(\frac{1}{8}\right)}_{\text{fraction of sphere desired}} \underbrace{\frac{4}{3}\pi(2)^3}_{\text{volume of sphere}} = \boxed{\frac{4}{3}\pi}$$

or:



rotated from since it is symmetrical.

$$0 \le \rho \le 2$$

$$0 \le \phi \le \pi$$

$$0 \le \theta \le \pi/4$$

$$\int_0^{\pi}\int_0^{\pi/4}\int_0^{2} 1\, dV$$ we change to spherical coord's.

$$\int_0^{\pi}\int_0^{\pi/4}\int_0^{2} \underbrace{\rho^2 \sin\phi}_{\text{magnification factor}}\, d\rho\, d\theta\, d\phi = \boxed{\frac{4}{3}\pi}$$