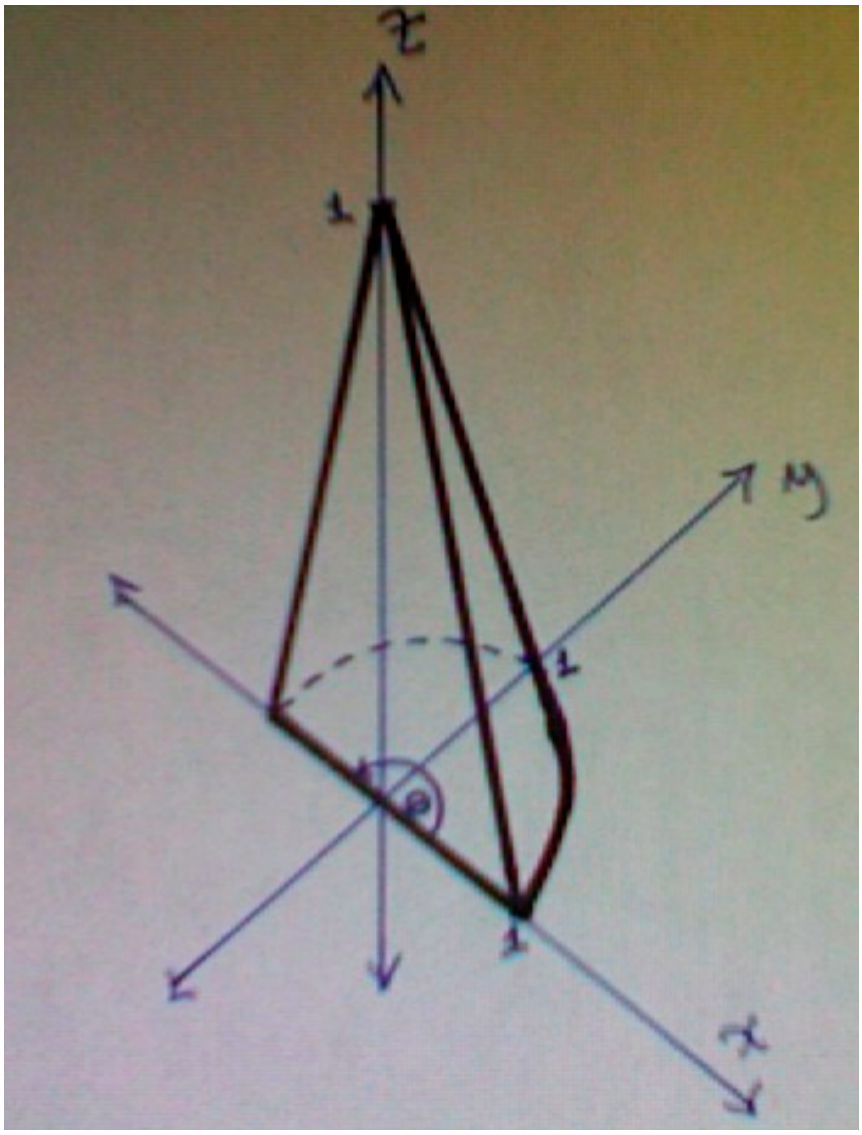
4

The solid region described by $0 \le r \le \sqrt{(1 - z)}$, $0 \le \Theta \le \pi$, and $0 \le z \le 1$ is...



Evaluating the triple integral...

$$J = \int_0^1 \int_0^{\pi} \int_0^{\sqrt{1-z}} (z^3 \sin\theta)\, r\, dr\, d\theta\, dz$$

$$= \int_0^1 \int_0^{\pi} \left(\left(\frac{r^2 (z^3 \sin\theta)}{2} \right) \Big|_0^{\sqrt{1-z}} \right) d\theta\, dz$$

$$= \int_0^1 \int_0^{\pi} \left(\frac{(z^3 - z^4)\sin\theta}{2} \right) d\theta\, dz$$

$$= \int_0^1 \left(\left(-\frac{(z^3 - z^4)\cos\theta}{2} \right) \Big|_0^{\pi} \right) dz$$

$$= \int_0^1 (z^3 - z^4)\, dz = \left(\frac{z^4}{4} - \frac{z^5}{5} \right) \Big|_0^1$$

$$= \frac{1}{4} - \frac{1}{5} = \boxed{\frac{1}{20}}$$