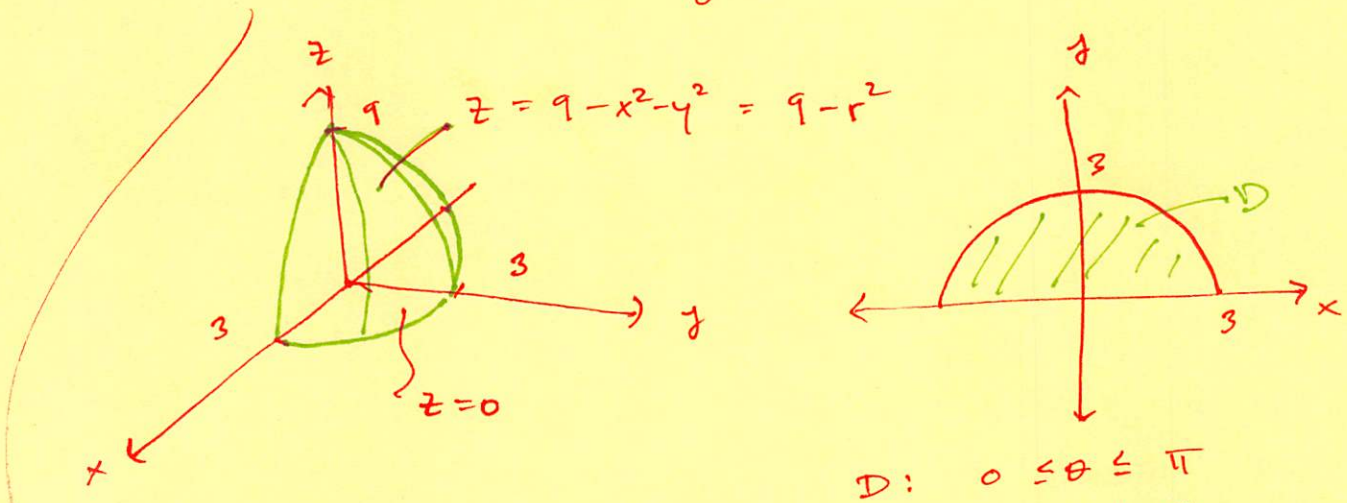
#30.

$$\int_{-3}^{3}\int_{0}^{\sqrt{9-x^2}}\int_{0}^{9-x^2-y^2}\sqrt{x^2+y^2}\,dz\,dy\,dx$$



D: $0 \le \theta \le \pi$

$0 \le r \le 3$

$$= \int_0^{\pi}\int_0^{3}\int_0^{9-r^2}\sqrt{r^2}\cdot r\,dz\,dr\,d\theta$$

$$= \pi\cdot\int_0^{3} r^2\cdot z\Big|_0^{9-r^2}\,dr$$

$$= \pi\int_0^{3} r^2(9-r^2)\,dr$$

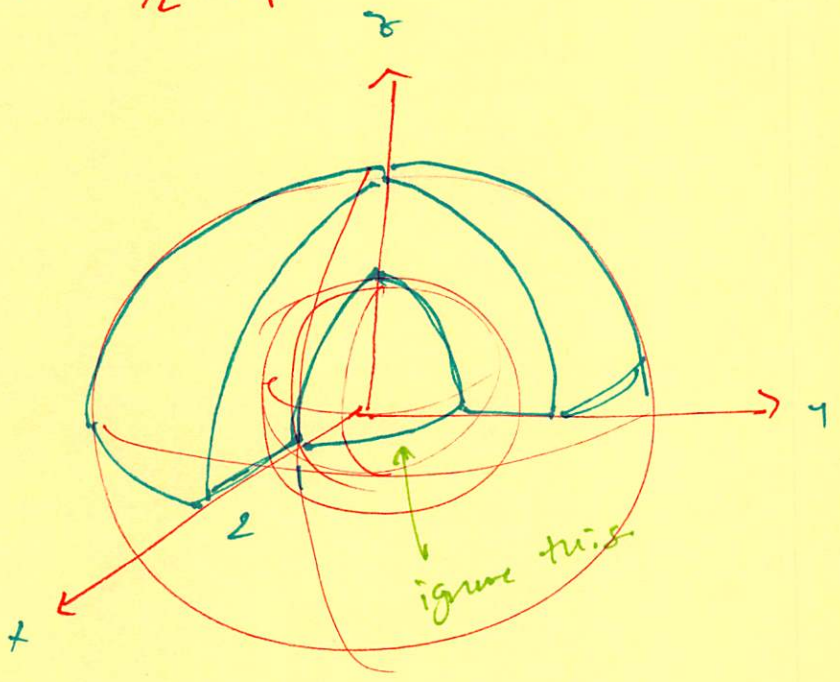
$$= \pi\left[3r^3 - \frac{1}{5}r^5\right]_0^{3}$$

$$= \pi\left(3^4 - \frac{1}{5}3^5\right) = 81\pi\left(1-\frac{3}{5}\right)$$

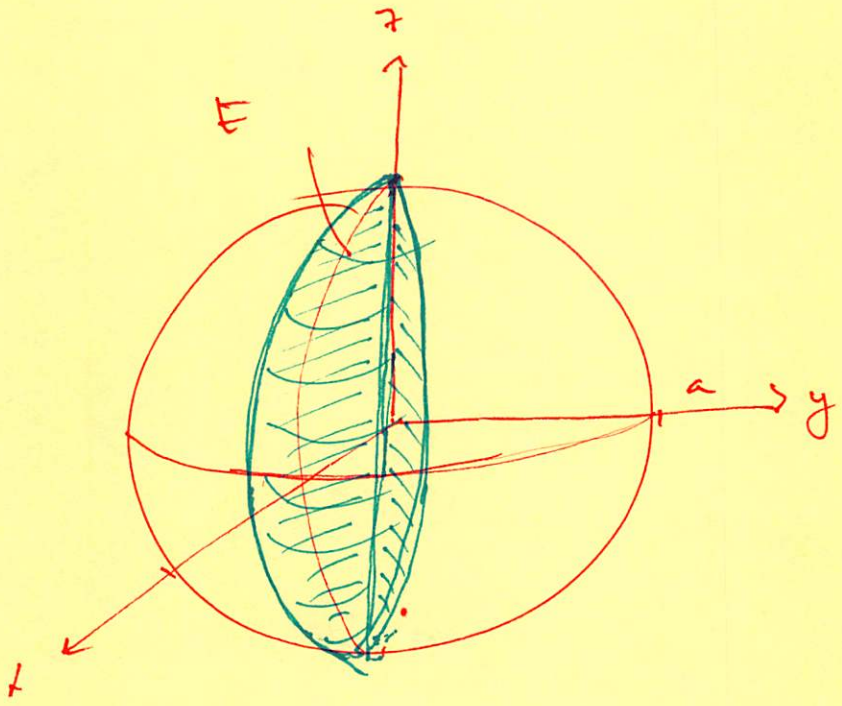
$$= 81\pi\cdot\frac{2}{5} = \frac{162\pi}{5}$$

#20.

$$\int_0^{\pi/2} \int_{\pi/2}^{2\pi} \int_1^2 f(\rho\sin\phi\cos\theta,\ \rho\sin\phi\sin\theta,\ \rho\cos\phi)\ \rho^2\sin\phi\ d\rho\, d\phi\, d\theta$$



#36.



$$V(E) = \iiint_E 1 \cdot dV = \int_0^{\pi/6} \int_0^{\pi} \int_0^{a} 1 \cdot \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$$

$$= \pi/6 \int_0^{\pi} \sin\phi \left. \frac{\rho^3}{3} \right|_0^{a} d\phi$$

$$= \frac{\pi a^3}{18} \left[-\cos\phi \right]_0^{\pi}$$

$$= \frac{\pi a^3}{18} (1 + 1)$$

$$= \frac{\pi a^3}{9}.$$