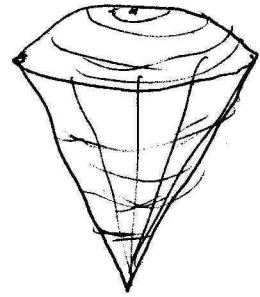


① Find the average  $z$ -coordinate inside the following cone with a spherical cap: HW38

$$C = \{(x, y, z) \mid \sqrt{2(x^2 + y^2)} \leq z \text{ \& } x^2 + y^2 + z^2 \leq 1\}$$



② Find the average  $y$ -coordinate inside the hemisphere  $H = \{(x, y, z) \mid y \geq 0 \text{ \& } x^2 + y^2 + z^2 \leq 16\}$

③ Simple models of Earth's atmosphere describe the density of air as  $\frac{dm}{dV} = A e^{-B\rho}$  for  $\rho \geq R$  where  $A$  &  $B$  are positive constants &  $\rho = \sqrt{x^2 + y^2 + z^2}$  is distance to the Earth's center at  $(0, 0, 0)$  &  $R$  is Earth's radius. Find a formula  $M(A, B, R)$  for the mass  $\iiint_K dm$  of the atmosphere where

$$K = \{(x, y, z) \mid \rho \geq R\}.$$