Evaluate the iterated integral

1) $\int_0^{\pi/2}\int_0^{2}\int_9^{9-r^2} r\,dz\,dr\,d\theta$

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

Use Cylindrical coordinates

3) Evaluate $\iiint_E \sqrt{x^2+y^2}\,dV$, where E is the region that lies inside the cylinder $x^2+y^2=16$ and between the planes $z=-5$ and $z=4$.

4) Evaluate $\iiint_E \sqrt{x^2+y^2}\,dV$, where E is enclosed by the paraboloid $z=1+x^2+y^2$, the cylinder $x^2+y^2=5$, and the xy-plane.

5) Find the volume of the region E bounded by the paraboloids $z = x^2 + y^2$ and $z = 36 - 3x^2 - 3y^2$. Also find the centroid of E (the center of mass in the case where the density is constant).

Use Spherical Coordinates

6) Evaluate $\iiint_E \left(x^2 + y^2 + z^2\right) dV$, where E is the unit ball $x^2 + y^2 + z^2 \le 1$.

7) Evaluate $\iiint_E xyz\, dV$, where E lies between the spheres $\rho = 2$, $\rho = 4$ and above the cone $\phi = \frac{\pi}{3}$.

8) Let H be a solid hemisphere of radius a whose density at any point is proportional to its distance from the center of the base $\rho(x, y, z) = K\sqrt{x^2 + y^2 + z^2}$.

a) Find the mass of H.

b) Find the center of mass of H.

c) Find the moment of inertia of H about its axis I_z.

9) Evaluate $\int_{-1}^{1}\int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}}\int_{x^2+y^2}^{2-x^2-y^2}\left(x^2 + y^2\right)^{3/2}\,dz\,dy\,dx$ by changing to cylindrical coordinates.

10) Evaluate $\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}}\int_{0}^{\sqrt{9-x^2-y^2}} z\sqrt{x^2 + y^2 + z^2}\,dz\,dy\,dx$ by changing to spherical coordinates.