

12.8 Integration in Cylindrical and Spherical Coordinates

Cylindrical Coordinates

Example 1

A solid E lies within the cylinder $x^2 + y^2 = 1$, below the plane $z = 4$ and above the paraboloid $z = 1 - x^2 - y^2$. The density at any point is proportional to its distance from the axis of the cylinder.. Find the mass of E .

Example 2

Evaluate

$$\int_{-2}^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_{\sqrt{x^2+y^2}}^2 (x^2 + y^2) dz dy dx$$

Spherical Coordinates

Example 3

Evaluate

$$\iiint_B e^{(x^2+y^2+z^2)^{\frac{3}{2}}} dV$$

Where B is the unit ball.

Example 4

Evaluate

$$\iiint_H (x^2 + y^2) dV$$

Where H is the hemispherical region that lies above the xy -plane and below the sphere $x^2 + y^2 + z^2 = 1$.