

Triple Integrals in Cylindrical Coordinates

1. Evaluate the iterated integral
(Similar to p.1043 #1-6)

$$\int_{-2}^3 \int_0^{\pi/2} \int_0^1 (r^2 \sin \theta) \, dr \, d\theta \, dz$$

2. Evaluate the iterated integral
(Similar to p.1043 #1-6)

$$\int_0^{2\pi} \int_0^{\pi/2} \int_0^{\sin \phi} (\rho^3 \cos \phi) \, d\rho \, d\phi \, d\theta$$

Conversion from Rectangular to Cylindrical

$$\begin{aligned} & \iiint_Q f(x, y, z) \, dV \\ &= \int_{\theta_1}^{\theta_2} \int_{g_1(\theta)}^{g_2(\theta)} \int_{h_1(r \cos \theta, r \sin \theta)}^{h_2(r \cos \theta, r \sin \theta)} f(r \cos \theta, r \sin \theta, z) \, r \, dz \, dr \, d\theta \end{aligned}$$

3. Convert the integral from rectangular coordinates to cylindrical ($dz \, dr \, d\theta$) and evaluate the iterated integral
(Similar to p.1043 #13-16)

$$\int_{-4}^4 \int_{-\sqrt{16-x^2}}^{\sqrt{16-x^2}} \int_{x^2+y^2}^{16} (x) \, dz \, dy \, dx$$

4. Use cylindrical coordinates to find the mass of the solid Q
(Similar to p.1043 #23-24)

$$\begin{aligned} Q &: \{(x, y, z) : 0 \leq z \leq 5 - x - 3y, x^2 + y^2 \leq 9\} \\ \rho(x, y, z) &= k\sqrt{x^2 + y^2} \end{aligned}$$