

(19) In cylindrical coordinates,

$$E = \{ (r, \theta, z) \mid \theta \in [0, \frac{\pi}{2}] \wedge r \in [0, 3] \wedge z \in [0, 2] \}$$

$$\int_0^{\frac{\pi}{2}} \int_0^3 \int_0^2 f(r \cos \theta, r \sin \theta, z) r \, dz \, dr \, d\theta$$

(21) $\iiint_B (x^2 + y^2 + z^2)^2 \, dV = \iiint_B p^4 (p^2 \sin \phi) \, dp \, d\theta \, d\phi$

$$B = \{ (p, \theta, \phi) \mid \phi \in [0, \pi] \wedge \theta \in [0, 2\pi] \wedge p \in [0, 5] \}$$

$$\int_0^{\pi} \int_0^{2\pi} \int_0^5 p^6 \sin \phi \, dp \, d\theta \, d\phi$$

$$\int_0^{\pi} \sin \phi \, d\phi \int_0^{2\pi} d\theta \int_0^5 p^6 \, dp$$

$$[-\cos \phi]_0^{\pi} (2\pi) \left(\frac{5^7}{7} \right) = 4\pi \left(\frac{5^7}{7} \right) = \boxed{\frac{312500\pi}{7}}$$