

4. Let E be the tetrahedron shown in the figure.

a. Fill in the boxes so that the following equality holds for all continuous functions f where (x, y, z) are the rectangular coordinates.

$$\iiint_E f(x, y, z) dV = \int_{\boxed{0}}^{\boxed{1}} \int_{\boxed{x}}^{\boxed{1}} \int_{\boxed{0}}^{\boxed{1-y}} f(x, y, z) dz dy dx$$

b. Fill in the boxes so that the following equality holds for all continuous functions f where (r, θ, z) are the cylindrical coordinates.

$$\iiint_E f(x, y, z) dV = \int_{\boxed{\pi/4}}^{\boxed{\pi/2}} \int_{\boxed{0}}^{\boxed{\csc \theta}} \int_{\boxed{0}}^{\boxed{1-r \sin \theta}} f(r \cos \theta, r \sin \theta, z) r dz dr d\theta$$

c. Fill in the boxes so that the following equality holds for all continuous functions f where (ρ, ϕ, θ) are the spherical coordinates.

$$\begin{aligned} & \iiint_E f(x, y, z) dV \\ &= \int_{\boxed{\pi/4}}^{\boxed{\pi/2}} \int_{\boxed{0}}^{\boxed{\pi/2}} \int_{\boxed{0}}^{\boxed{1/(\sin \phi \sin \theta + \cos \phi)}} f(\rho \sin \phi \cos \theta, \rho \sin \phi \sin \theta, \rho \cos \phi) \rho^2 \sin \phi d\rho d\phi d\theta \end{aligned}$$

