

1. (cylindrical coordinates) Sketch the  $rz$  cross-section associated with the region of integration in the integral below and describe the shape of the 3D region.

$$\int_0^{2\pi} \int_1^5 \int_0^{\sqrt{25-r^2}} z^2 \, dz \, dr \, d\theta.$$

2. (spherical coordinates) Sketch the  $rz$  cross-section associated with the region of integration in the integral below and describe the shape of the 3D region.

$$\int_0^{2\pi} \int_0^{\pi/4} \int_0^{2/\cos\phi} \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta.$$

3. Let  $p$  be the joint probability density function such that  $p(x, y) = \frac{3}{8}y^2$  in the rectangle  $R$  where  $0 \leq x \leq 1, 0 \leq y \leq 2$ .  $p(x, y) = 0$  outside of the rectangle. Set up an integral for the probability that  $(x, y)$  satisfies  $x + y \geq 2$ .