

1. Parametrize and give bounds for the portion of the paraboloid $z = x^2 + y^2$ lying above the rectangle with vertices $(0,0)$, $(2,0)$, $(2,3)$, and $(0,3)$.

$$x(u, v) = u$$

$$y(u, v) = v$$

$$z(u, v) = u^2 + v^2$$

$$\text{for } 0 \leq u \leq 2, 0 \leq v \leq 3$$

2. Parametrize and give bounds for the portion of the cylinder with radius 4 centered around the z -axis between $z = 2$ and $z = 10$.

$$x(u, v) = 4 \cos u$$

$$y(u, v) = 4 \sin u$$

$$z(u, v) = v$$

$$\text{for } 0 \leq u \leq 2\pi, 2 \leq v \leq 10$$

3. Parametrize and give bounds for a sphere with radius 5, centered at the origin.

$$x(u, v) = 5 \sin u \cos v$$

$$y(u, v) = 5 \sin u \sin v$$

$$z(u, v) = 5 \cos u$$

$$\text{for } 0 \leq u \leq \pi, 0 \leq v \leq 2\pi$$

1. Parametrize and give bounds for the rectangle with vertices $(3,0,0)$, $(3,2,0)$, $(3,2,5)$, and $(3,0,5)$.

$$x(u, v) = 3$$

$$y(u, v) = u$$

$$z(u, v) = v$$

$$\text{for } 0 \leq u \leq 2, 0 \leq v \leq 5$$

2. Parametrize and give bounds for the right half (i.e. the portion with positive y coordinates) of the cylinder with radius a and centered on the x -axis between $x = 0$ and $x = 5$.

$$x(u, v) = u$$

$$y(u, v) = a \cos v$$

$$z(u, v) = a \sin v$$

$$\text{for } 0 \leq u \leq 5, -\pi/2 \leq v \leq \pi/2$$

3. Parametrize and give bounds for the portion to the right of $y = 0$ of a sphere with radius 5, centered at the origin.

$$x(u, v) = 5 \sin u \cos v$$

$$y(u, v) = 5 \sin u \sin v$$

$$z(u, v) = 5 \cos u$$

$$\text{for } 0 \leq u \leq \pi, 0 \leq v \leq \pi$$