12.6

1

$(x/2)^2 + (y/3)^2 + (z/5)^2 = 1$

Ellipsoid

3

$x^2 + 3y^2 + 9z^2 = 1$

Ellipsoid

5

$x^2 - 3y^2 + 9z^2 = 1$
$x^2 + 9z^2 = 3y^2 + 1$

Hyperboloid on the y-axis with one sheet

12.7

1

$(4, \pi, 4)$ Cylindrical

$= (4\cos\pi, 4\sin\pi, 4)$ Rectangular
$= (-4, 0, 4)$

5

$(1, -1, 1)$ Rectangular

$= (\sqrt{2}, \tan(-1/1), 1)$ Cylindrical
$= (\sqrt{2}, -\pi/4, 1)$

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$x^2 + y^2 \leq 3$

$(r\cos\theta)^2 + (r\sin\theta)^2 \leq 3$
$r^2(\cos^2\theta + \sin^2\theta) \leq 3$
$r^2 \leq 3$

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$x^2 + y^2 \leq 9$
$x \geq y$

$(r\cos\theta)^2 + (r\sin\theta)^2 \leq 9$
$r^2(\cos^2\theta + \sin^2\theta) \leq 9$
$r^2 \leq 9$

$r\cos\theta \geq r\sin\theta$
$\cos\theta \geq \sin\theta$
$5\pi/4 + 2\pi N \leq \theta \leq 9\pi/4 + 2\pi N$ or $13\pi/4 + 2\pi N \leq \theta \leq 17\pi/4 + 2\pi N$

$r^2 \leq 9$
$5\pi/4 + 2\pi N \leq \theta \leq 9\pi/4 + 2\pi N$ or $13\pi/4 + 2\pi N \leq \theta \leq 17\pi/4 + 2\pi N$

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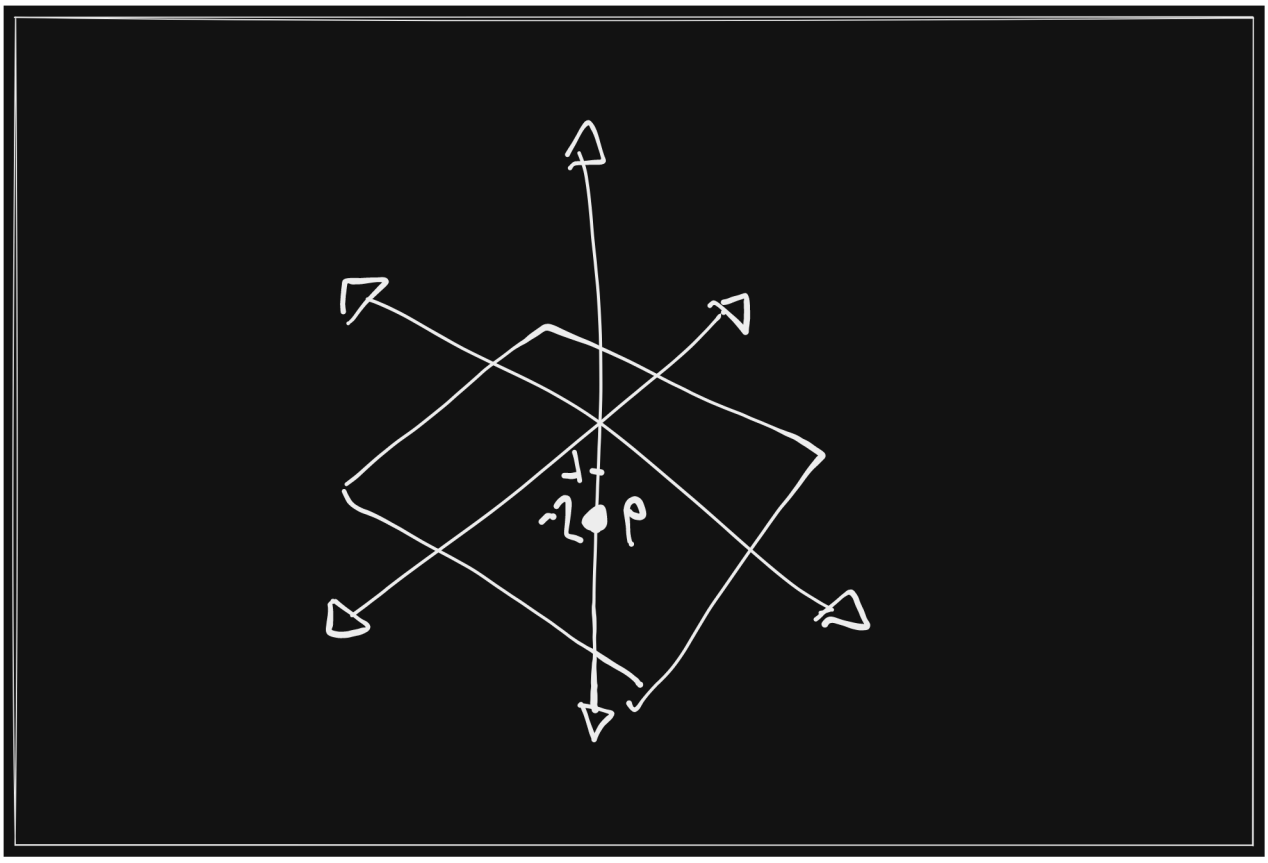
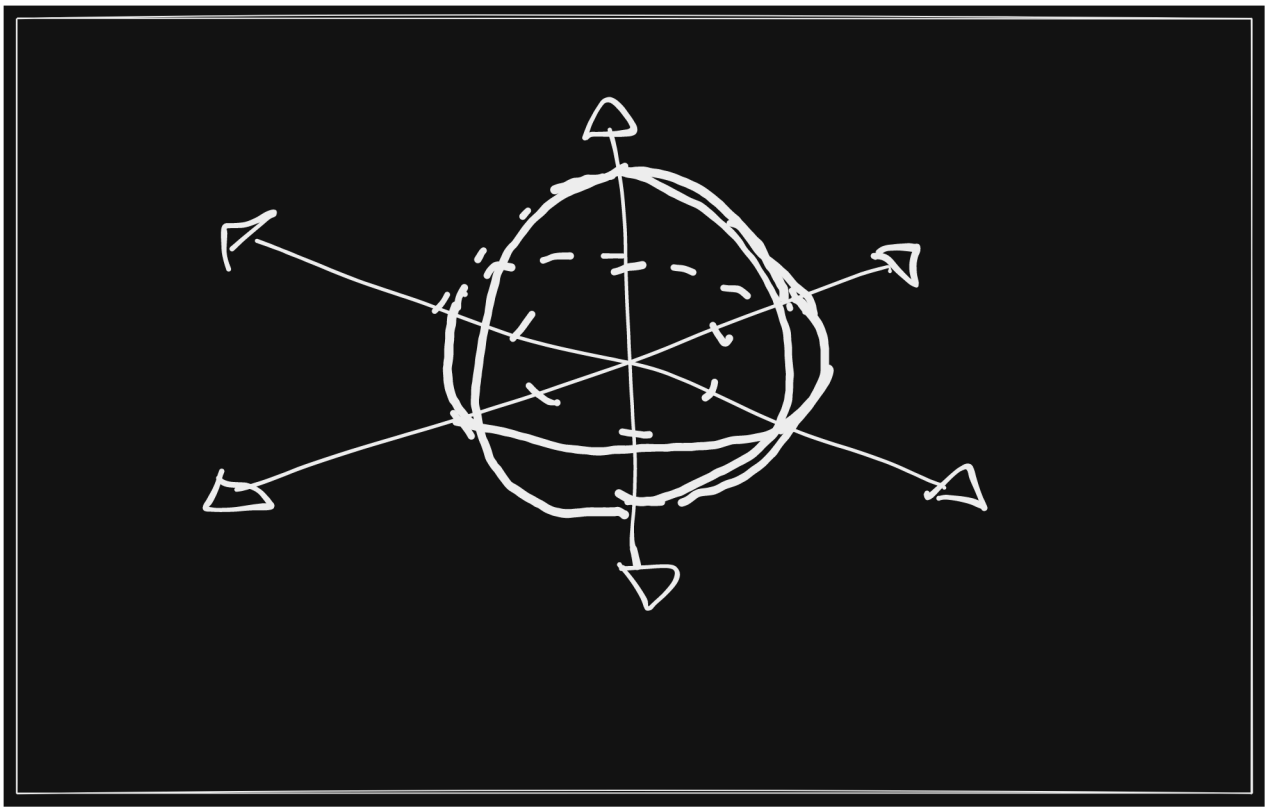


25



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$(6, \pi/6, 5\pi/6)$ Spherical
$(6\sin(5\pi/6)\cos(\pi/6), 6\sin(5\pi/6)\sin(\pi/6), 6\cos(5\pi/6))$ Rectangular
$= (2.598, 1.500, -5.196)$

47

$(4, 0, \pi/4)$ Spherical
$(p\sin\phi, \theta, p\cos(\phi))$ Cylindrical
$= (4\sin(\pi/4), 0, 4\cos(\pi/4))$
$= (2.828, 0, 2.828)$