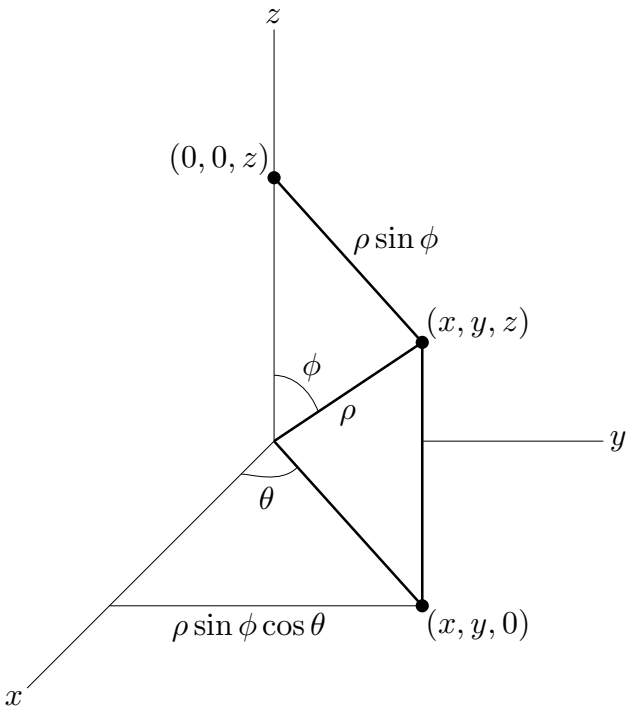
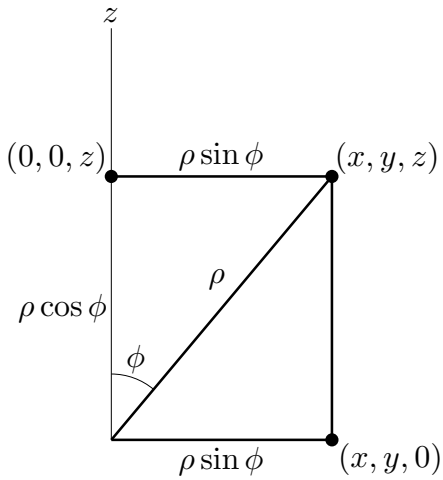
SPHERICAL COORDINATES





Side View

$\rho =$ distance from (x, y, z) to $(0, 0, 0)$

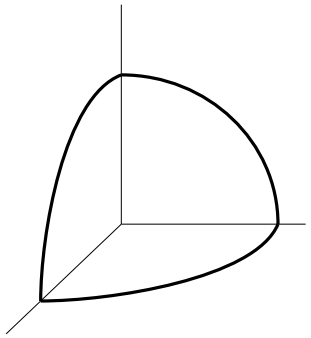
$\phi =$ angle between the line $\overline{(0, 0, 0)\,(x, y, z)}$ and the z axis

$\theta =$ angle between the line $\overline{(0, 0, 0)\,(x, y, 0)}$ and the x axis

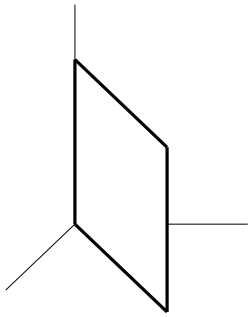
$$x = \rho \sin\phi \cos\theta \qquad \rho = \sqrt{x^2 + y^2 + z^2}$$

$$y = \rho \sin\phi \sin\theta \qquad \theta = \tan^{-1} \frac{y}{x}$$

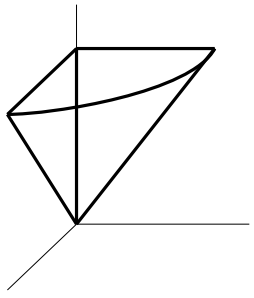
$$z = \rho \cos\phi \qquad \phi = \tan^{-1} \frac{\sqrt{x^2 + y^2}}{z}$$



surface of constant ρ



surface of constant θ



surface of constant ϕ

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