

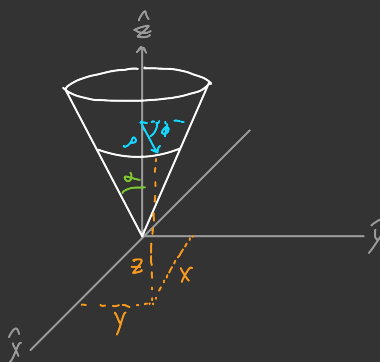
Classical Mechanics: Problem 7.10

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Last updated: August 15, 2023

Using the figure below,



choosing \hat{y} as the axis in which ϕ begins,

$$\begin{aligned}x &= \rho \sin \phi \\y &= \rho \cos \phi \\z &= \rho \cot \alpha.\end{aligned}$$

In terms of ϕ and ρ ,

$$\begin{aligned}\rho &= \sqrt{x^2 + y^2} \\ \phi &= \arctan\left(\frac{y}{x}\right).\end{aligned}$$

The "so what" of this problem is to show that for certain systems, other coordinate systems can reduce the number of variables considerably.