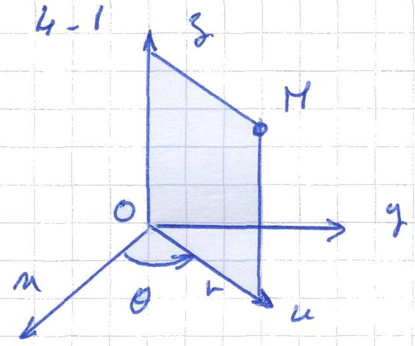
4-1



coordonnées cartésiennes $M(1, 1, \sqrt{2})$

a) <u>coordonnées cylindriques de M</u> (r, θ, z)

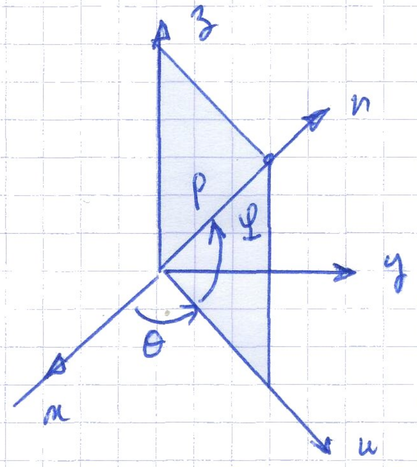
$\vec{OM} = r\vec{u} + z\vec{k}$ avec $\theta = (\vec{x}, \vec{u})$

$OM = r\cos\theta\,\vec{x} + r\sin\theta\,\vec{y} + z\vec{k}$

$$\Rightarrow \begin{cases} r\cos\theta = 1 \\ r\sin\theta = 1 \\ z = \sqrt{2} \end{cases} \Rightarrow tg\,\theta = 1 \Rightarrow \theta = \frac{\pi}{4} + k\pi$$

$$\cos\theta = \frac{\sqrt{2}}{2} \Rightarrow r = \frac{2}{\sqrt{2}} = \sqrt{2}$$

$$\Rightarrow M\left(\sqrt{2}, \frac{\pi}{4}, \sqrt{2}\right)$$



b) <u>coordonnées sphériques</u>. (ρ, θ, φ)

$\vec{OM} = \rho\vec{n}$ avec $\varphi = (\vec{u}, \vec{n})$ et $\theta = (\vec{x}, \vec{u})$

$= \rho(\cos\varphi\,\vec{u} + \sin\varphi)\vec{z}$

$= \rho\cos\varphi\cos\theta\,\vec{x} + \rho\cos\varphi\sin\theta\,\vec{y} + \rho\sin\varphi\,\vec{z}$

$$\Rightarrow \begin{cases} \rho\cos\varphi\cos\theta = 1 \\ \rho\cos\varphi\sin\theta = 1 \\ \rho\sin\varphi = \sqrt{2} \end{cases} \Rightarrow tg\,\theta = 1 \Rightarrow \theta = \frac{\pi}{4} + k\pi$$

$$\sin\theta = \frac{\sqrt{2}}{2}$$

$$\Rightarrow \rho\cos\varphi = \frac{1}{\sin\theta} = \frac{2}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$$

$$\Rightarrow tg\,\varphi = 1 \Rightarrow \theta = \frac{\pi}{4} + k\pi$$

$$\Rightarrow \rho = \frac{1}{\sin\theta\cos\varphi} = \sqrt{2} \times \frac{2}{\sqrt{2}} = 2$$

$$\Rightarrow M\left(2, \frac{\pi}{4}, \frac{\pi}{4}\right)$$