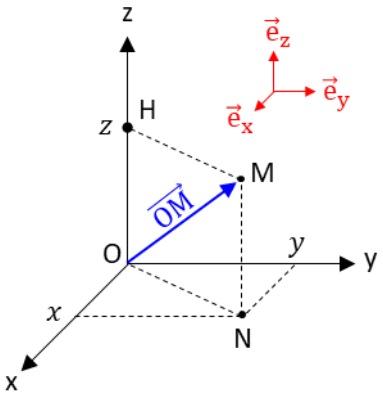
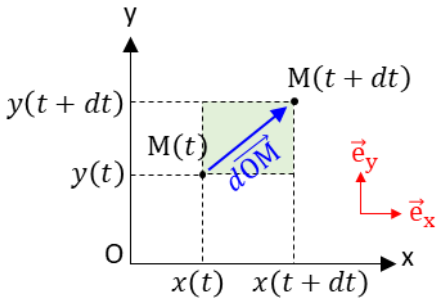
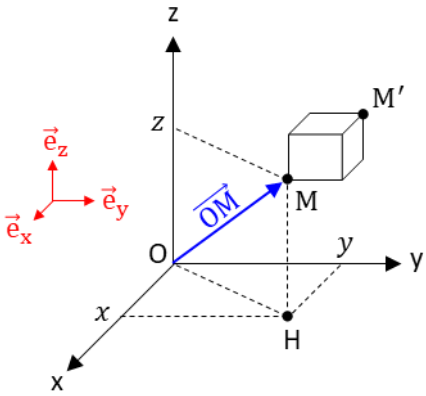
Fiche Mémo

Les repères en mécanique

Base cartésienne







Position, vitesse et accélération

$$\overrightarrow{OM} = x\,\vec{e}_x + y\,\vec{e}_y + z\,\vec{e}_z$$

$$d\overrightarrow{OM} = dx\,\vec{e}_x + dy\,\vec{e}_y + dz\,\vec{e}_z$$

$$\vec{v} = \dot{x}\,\vec{e}_x + \dot{y}\,\vec{e}_y + \dot{z}\,\vec{e}_z$$

$$\vec{a} = \ddot{x}\,\vec{e}_x + \ddot{y}\,\vec{e}_y + \ddot{z}\,\vec{e}_z$$

Surface élémentaire

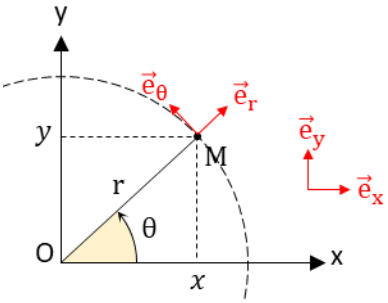
Dans le plan (Oxy) :

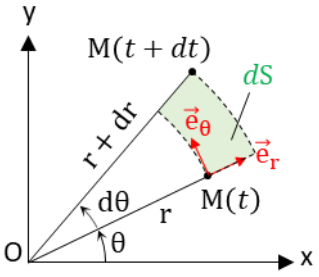
$$dS = dx \cdot dy$$

Volume élémentaire

$$dV = dx \cdot dy \cdot dz$$

Base polaire





Position, vitesse et accélération

$$\overrightarrow{OM} = r\,\vec{e}_r$$

$$d\overrightarrow{OM} = dr\,\vec{e}_r + r d\theta\,\vec{e}_\theta$$

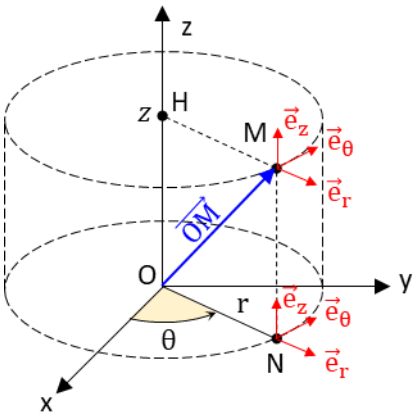
$$\vec{v} = \dot{r}\,\vec{e}_r + r\dot{\theta}\,\vec{e}_\theta$$

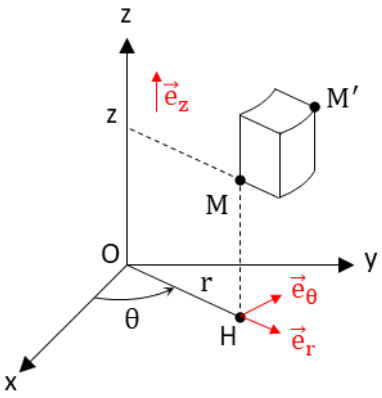
$$\vec{a} = \left(\ddot{r} - r\dot{\theta}^2\right)\vec{e}_r + \left(2\dot{r}\dot{\theta} + r\ddot{\theta}\right)\vec{e}_\theta$$

Surface élémentaire

$$dS = dr \cdot r d\theta = r dr \cdot d\theta$$

Base cylindrique





Position, vitesse et accélération

$$\overrightarrow{\mathrm{OM}} = r\,\vec{\mathrm{e}}_\mathrm{r} + z\,\vec{\mathrm{e}}_\mathrm{z}$$

$$d\overrightarrow{\mathrm{OM}} = dr\,\vec{\mathrm{e}}_\mathrm{r} + rd\theta\,\vec{\mathrm{e}}_\theta + dz\,\vec{\mathrm{e}}_\mathrm{z}$$

$$\vec{\mathrm{v}} = \dot{r}\,\vec{\mathrm{e}}_\mathrm{r} + r\dot{\theta}\,\vec{\mathrm{e}}_\theta + \dot{z}\,\vec{\mathrm{e}}_\mathrm{z}$$

$$\vec{\mathrm{a}} = \left(\ddot{r} - r\dot{\theta}^2\right)\vec{\mathrm{e}}_\mathrm{r} + \left(2\dot{r}\dot{\theta} + r\ddot{\theta}\right)\vec{\mathrm{e}}_\theta + \ddot{z}\,\vec{\mathrm{e}}_\mathrm{z}$$

Surface élémentaire

Sur une surface horizontale :

$$dS = dr \cdot rd\theta = rdr \cdot d\theta$$

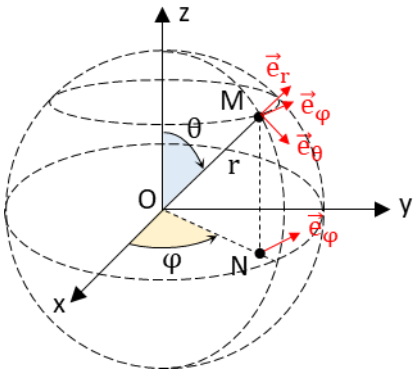
Sur la surface latérale

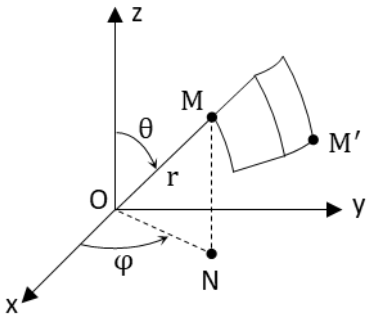
$$dS = rd\theta \cdot dz$$

Volume élémentaire

$$d\mathrm{V} = dr \cdot rd\theta \cdot dz$$

Base sphérique





Position, vitesse et accélération

$$\overrightarrow{\mathrm{OM}} = r\,\vec{\mathrm{e}}_\mathrm{r}$$

$$d\overrightarrow{\mathrm{OM}} = dr\,\vec{\mathrm{e}}_\mathrm{r} + rd\theta\,\vec{\mathrm{e}}_\theta + r\sin(\theta)\,d\varphi\,\vec{\mathrm{e}}_\varphi$$

$$\vec{\mathrm{v}} = \dot{r}\,\vec{\mathrm{e}}_\mathrm{r} + r\dot{\theta}\,\vec{\mathrm{e}}_\theta + r\dot{\varphi}\sin(\theta)\,\vec{\mathrm{e}}_\varphi$$

Surface élémentaire

Sur la surface de la sphère :

$$dS = rd\theta \cdot r\sin(\theta)\,d\varphi$$

Volume élémentaire

$$d\mathrm{V} = dr \cdot rd\theta \cdot r\sin(\theta)\,d\varphi$$