

Eletrromagnetismo

28 de março
Análise vetorial

Análise vetorial

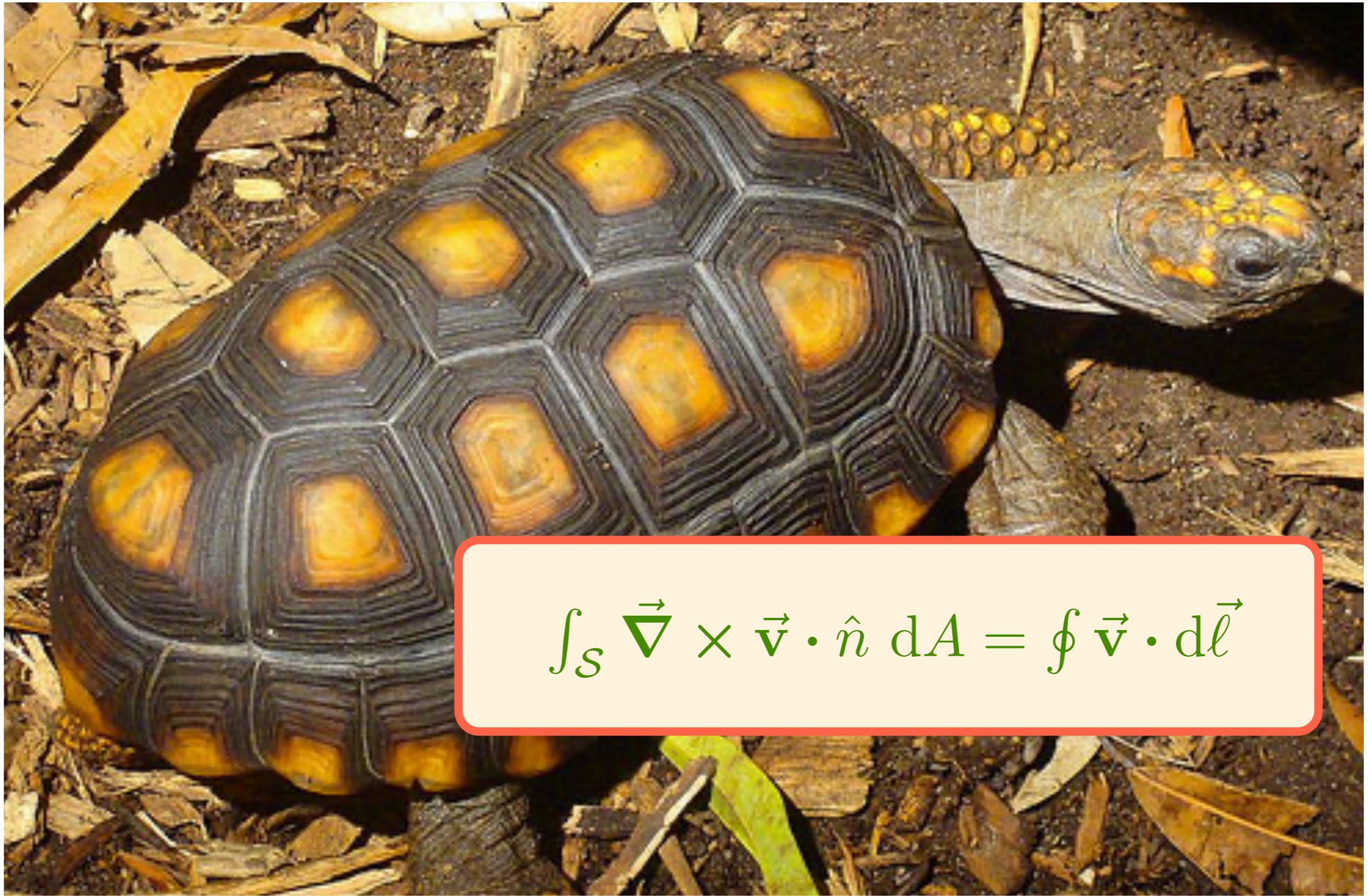
Teoremas fundamentais

$$\int_C \vec{\nabla} T \cdot d\vec{\ell} = T_b - T_a$$

$$\int_S \vec{\nabla} \times \vec{v} \cdot \hat{n} \, dA = \oint \vec{v} \cdot d\vec{\ell}$$

$$\int_V \vec{\nabla} \cdot \vec{v} \, d\tau = \int \vec{v} \cdot \hat{n} \, dA$$

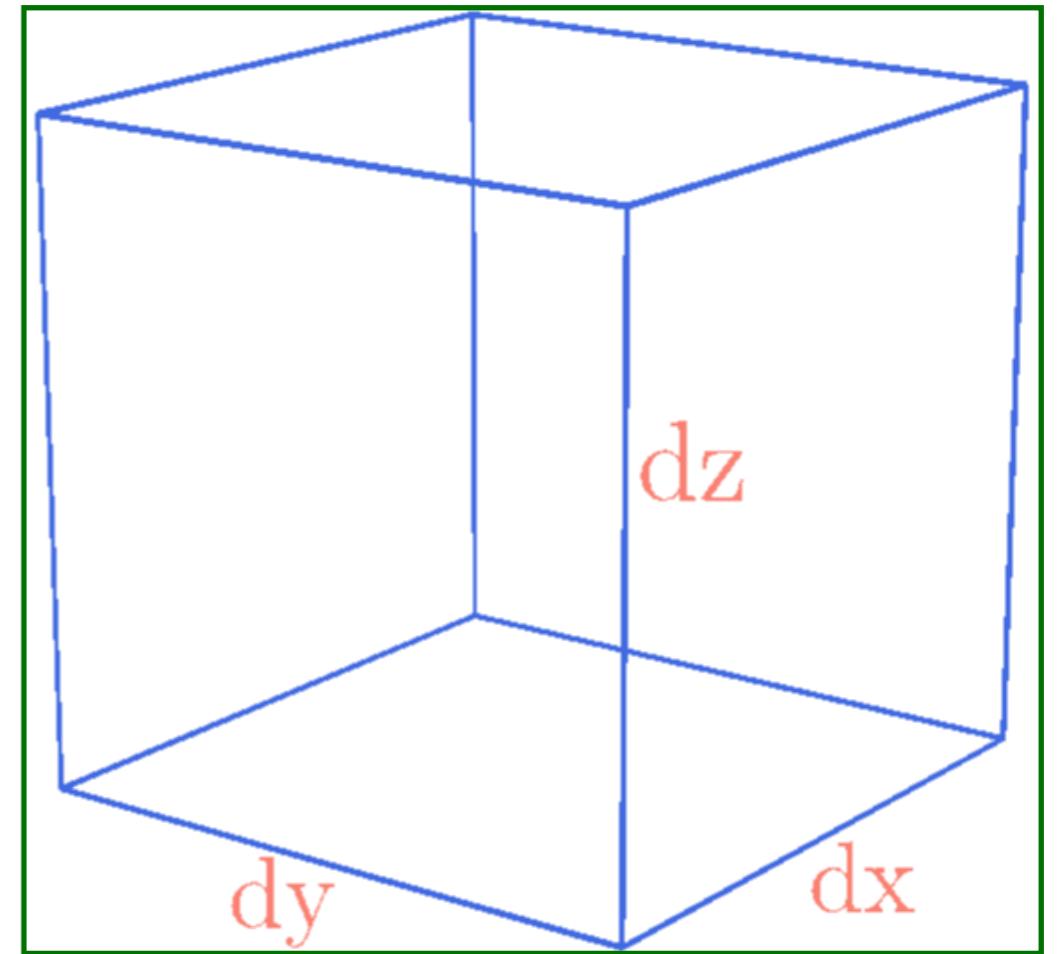
Rotacional



Cartesianas

$$d\vec{\ell} = dx \hat{x} + dy \hat{y} + dz \hat{z}$$

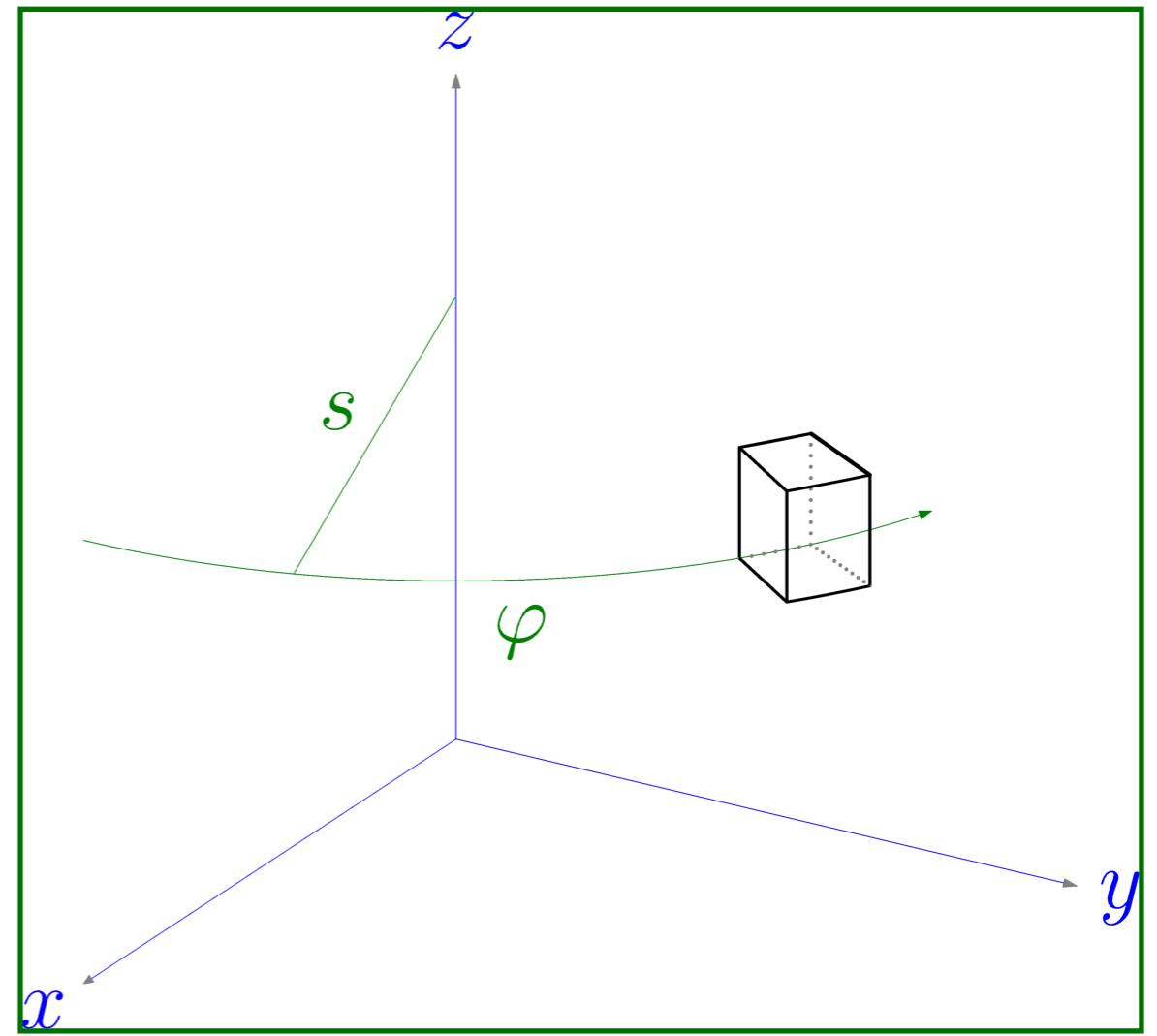
$$\begin{aligned}\vec{\nabla} \times \vec{v} = & \left(\frac{\partial v_z}{\partial y} - \frac{\partial v_y}{\partial z} \right) \hat{x} \\ & + \left(\frac{\partial v_x}{\partial z} - \frac{\partial v_z}{\partial x} \right) \hat{y} \\ & + \left(\frac{\partial v_y}{\partial x} - \frac{\partial v_x}{\partial y} \right) \hat{z}\end{aligned}$$



Coordenadas cilíndricas

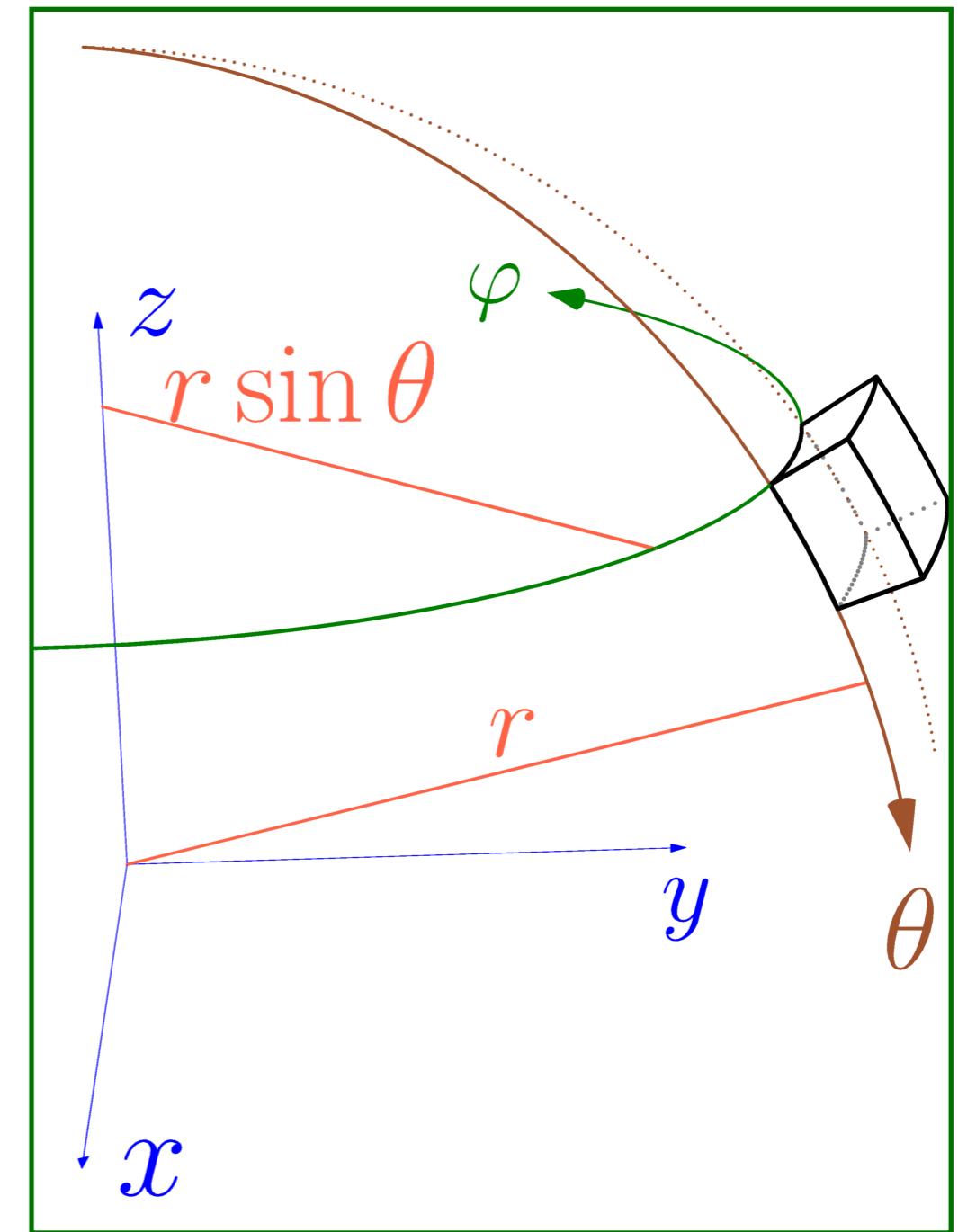
$$d\vec{\ell} = ds \hat{s} + s d\varphi \hat{\varphi} + dz \hat{z}$$

$$\begin{aligned}\vec{\nabla} \times \vec{v} = & \left(\frac{1}{s} \frac{\partial v_z}{\partial \varphi} - \frac{\partial v_\varphi}{\partial z} \right) \hat{s} \\ & + \left(\frac{\partial v_s}{\partial z} - \frac{\partial v_z}{\partial s} \right) \hat{\varphi} \\ & + \frac{1}{s} \left(\frac{\partial (sv_\varphi)}{\partial s} - \frac{\partial v_s}{\partial \varphi} \right) \hat{z}\end{aligned}$$



Coordenadas esféricicas

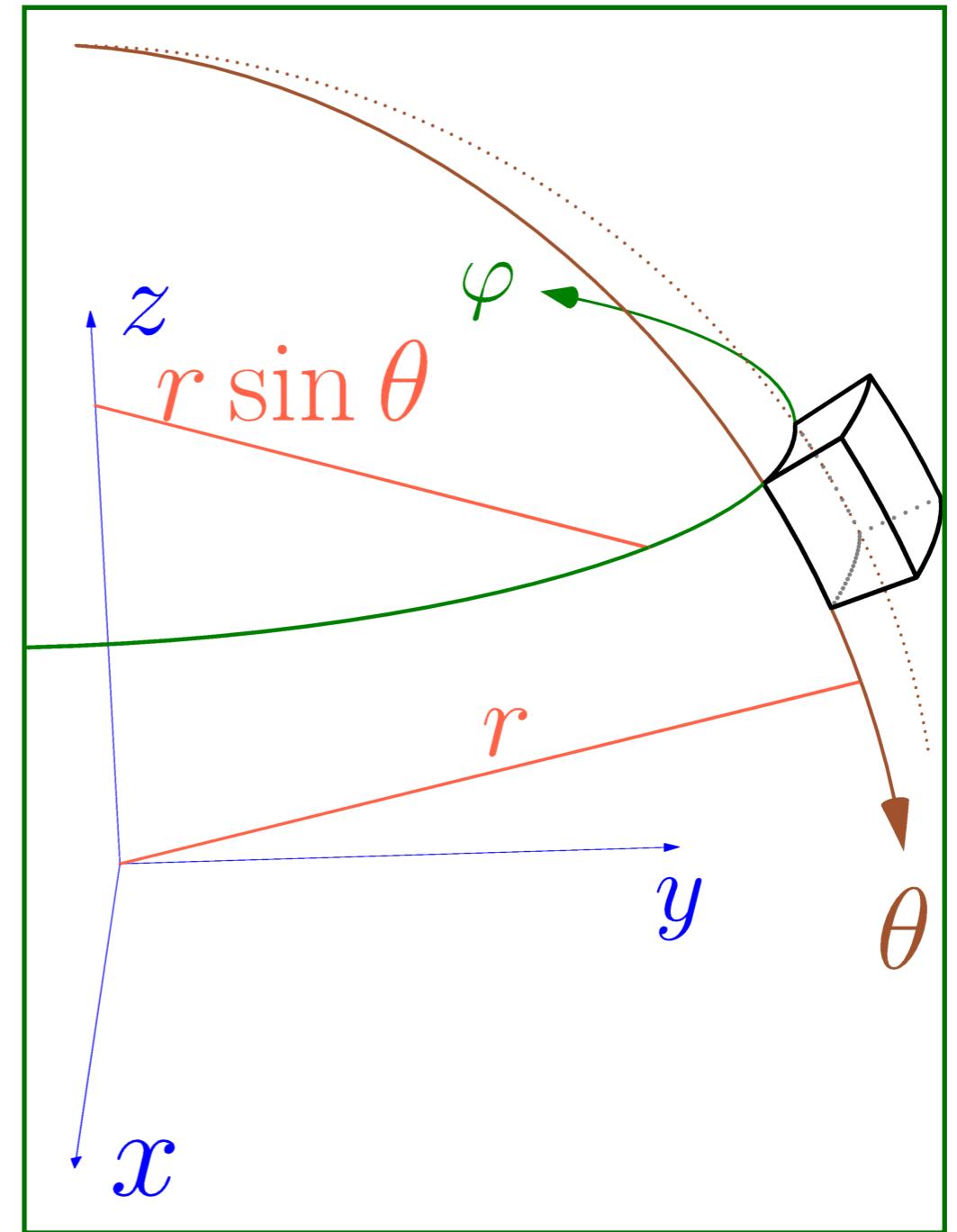
$$d\vec{r} = dr \hat{r} + r d\theta \hat{\theta} + r \sin \theta d\phi \hat{\phi}$$



Coordenadas esféricas

$$d\vec{r} = dr \hat{r} + r d\theta \hat{\theta} + r \sin \theta d\varphi \hat{\varphi}$$

$$\begin{aligned}\vec{\nabla} \times \vec{v} = & \frac{1}{r \sin \theta} \left(\frac{\partial(\sin \theta v_\varphi)}{\partial \theta} - \frac{\partial v_\theta}{\partial \varphi} \right) \hat{r} \\ & + \frac{1}{r} \left(\frac{1}{\sin \theta} \frac{\partial v_r}{\partial \varphi} - \frac{\partial(r v_\varphi)}{\partial r} \right) \hat{\theta} \\ & + \frac{1}{r} \left(\frac{\partial(r v_\theta)}{\partial r} - \frac{\partial v_r}{\partial \theta} \right) \hat{\varphi}\end{aligned}$$



A portrait painting of Georges Cuvier, a French naturalist. He is shown from the chest up, wearing a dark velvet jacket over a white cravat and a yellow waistcoat. He has white hair and a slight smile. The background is dark.

Divergente

$$\int_V \vec{\nabla} \cdot \vec{v} \, d\tau = \int \vec{v} \cdot \hat{n} \, dA$$