

Eletromagnetismo

16 de março
Análise vetorial

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Teoremas fundamentais

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

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

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

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Teoremas fundamentais

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

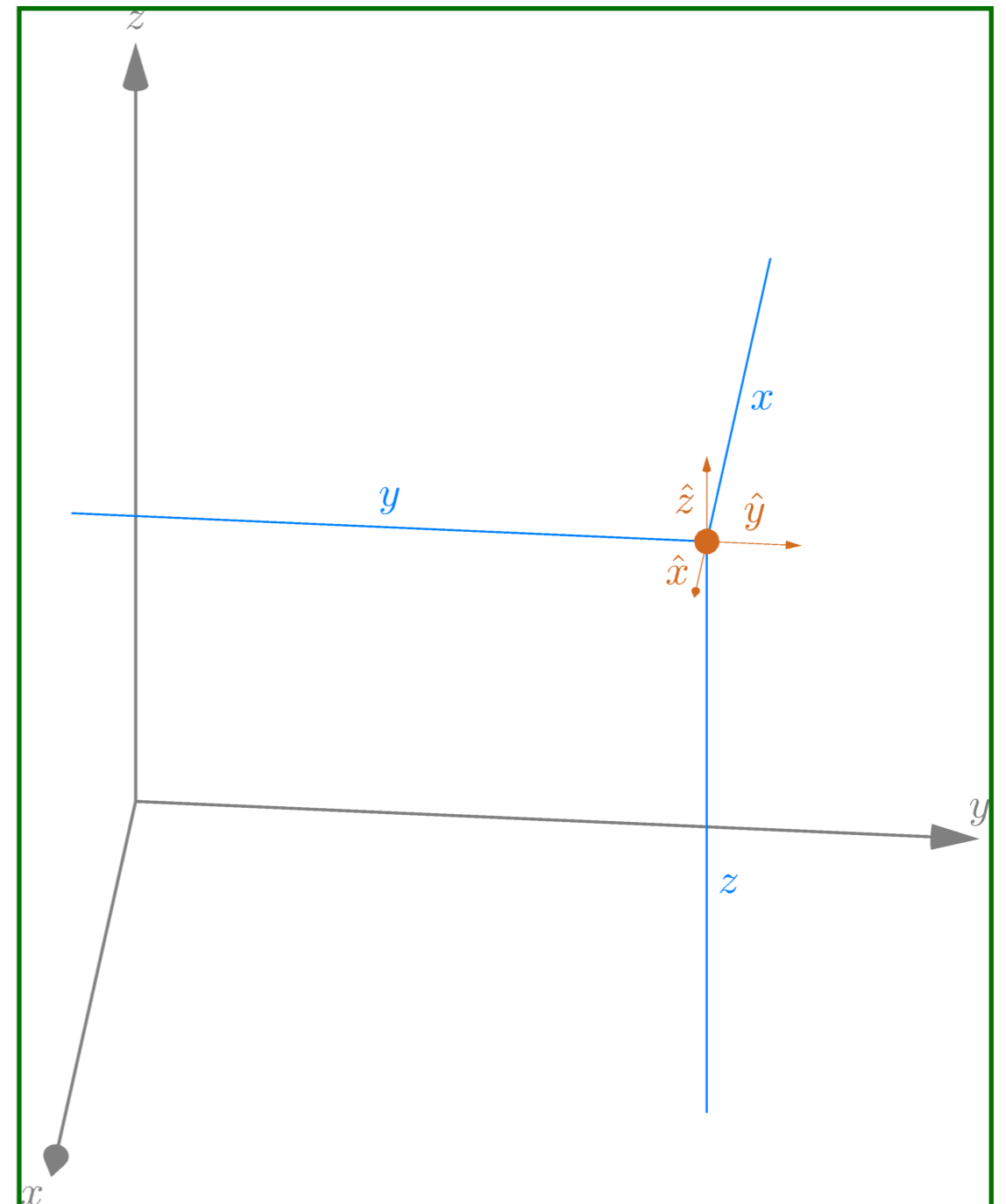
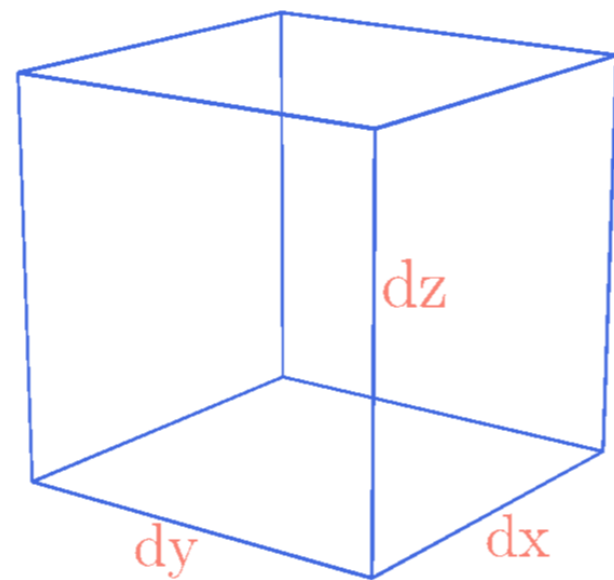
$$\int_S \vec{\nabla} \times \vec{v} \cdot \hat{n} \, dA = \oint \vec{v} \cdot d\vec{\ell}$$

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



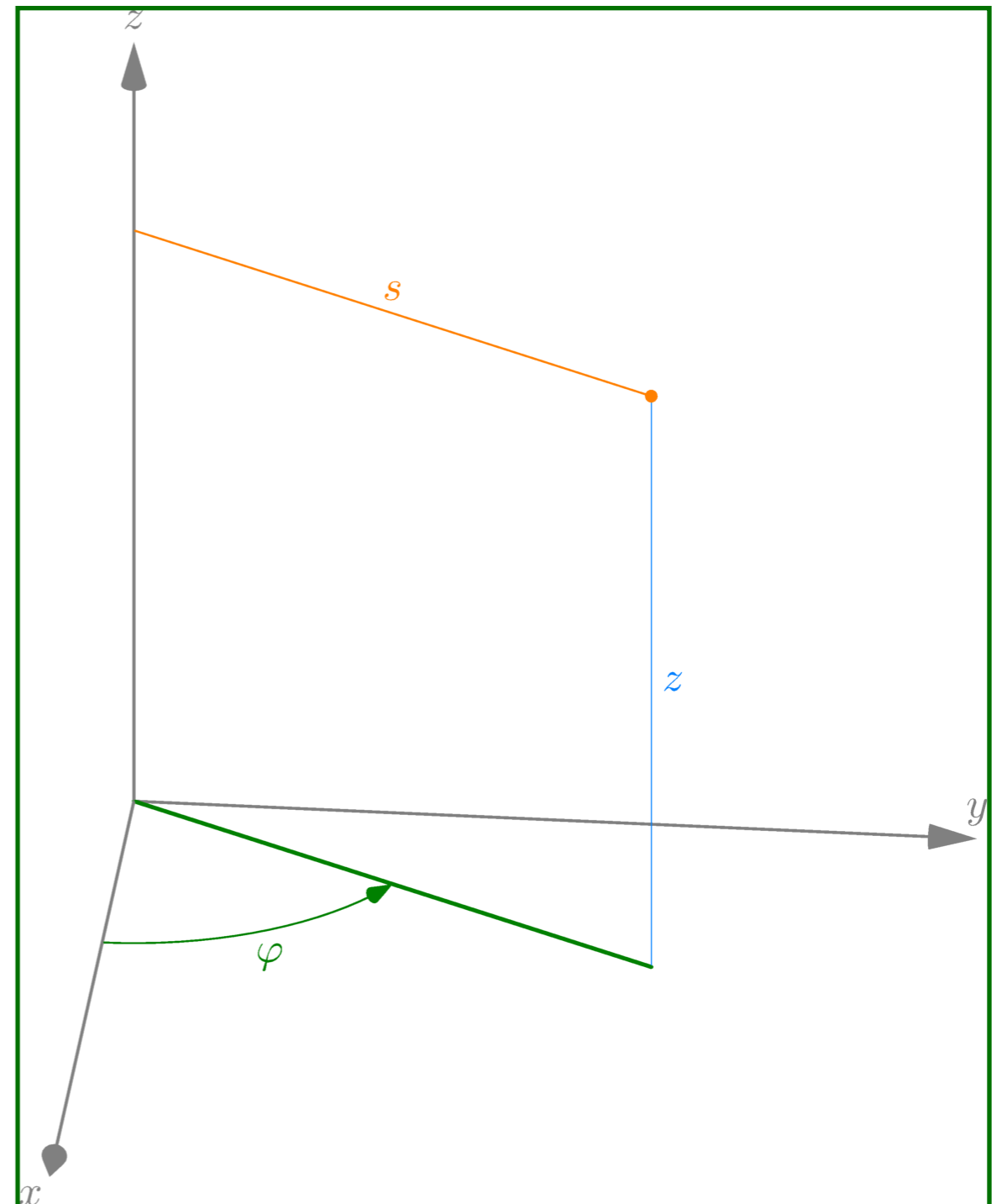
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Coordenadas cartesianas



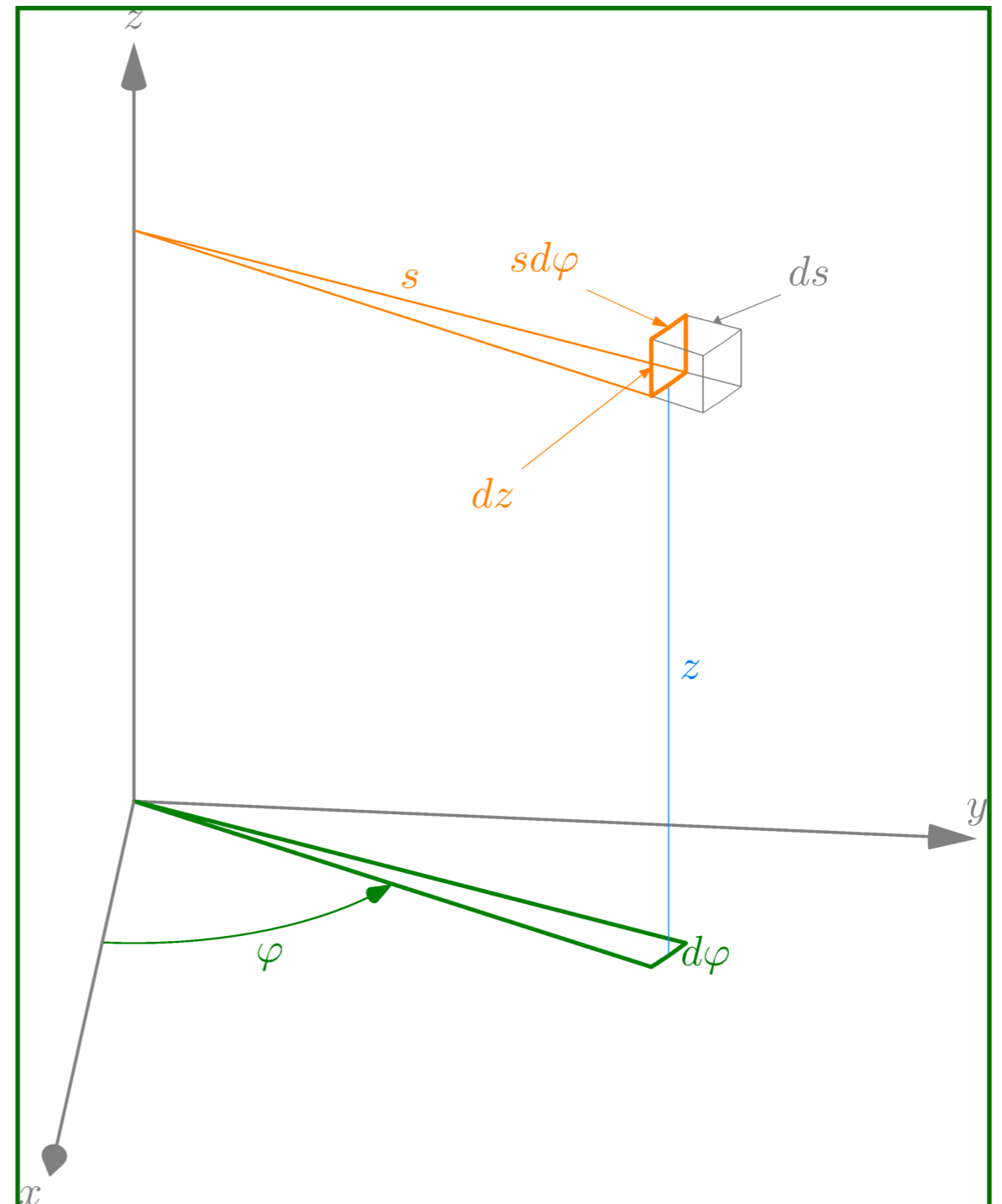
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Coordenadas cilíndricas



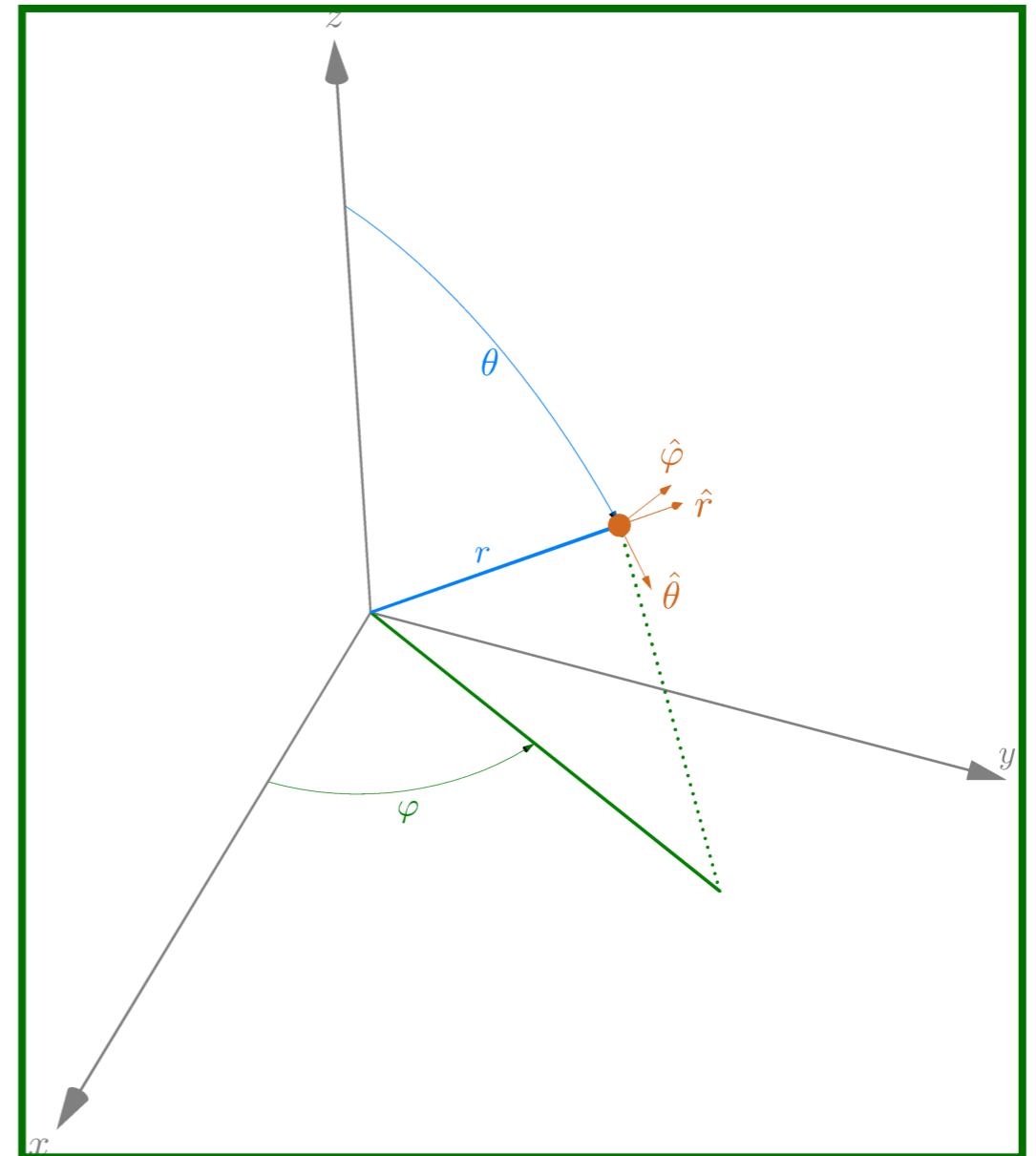
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Coordenadas cilíndricas



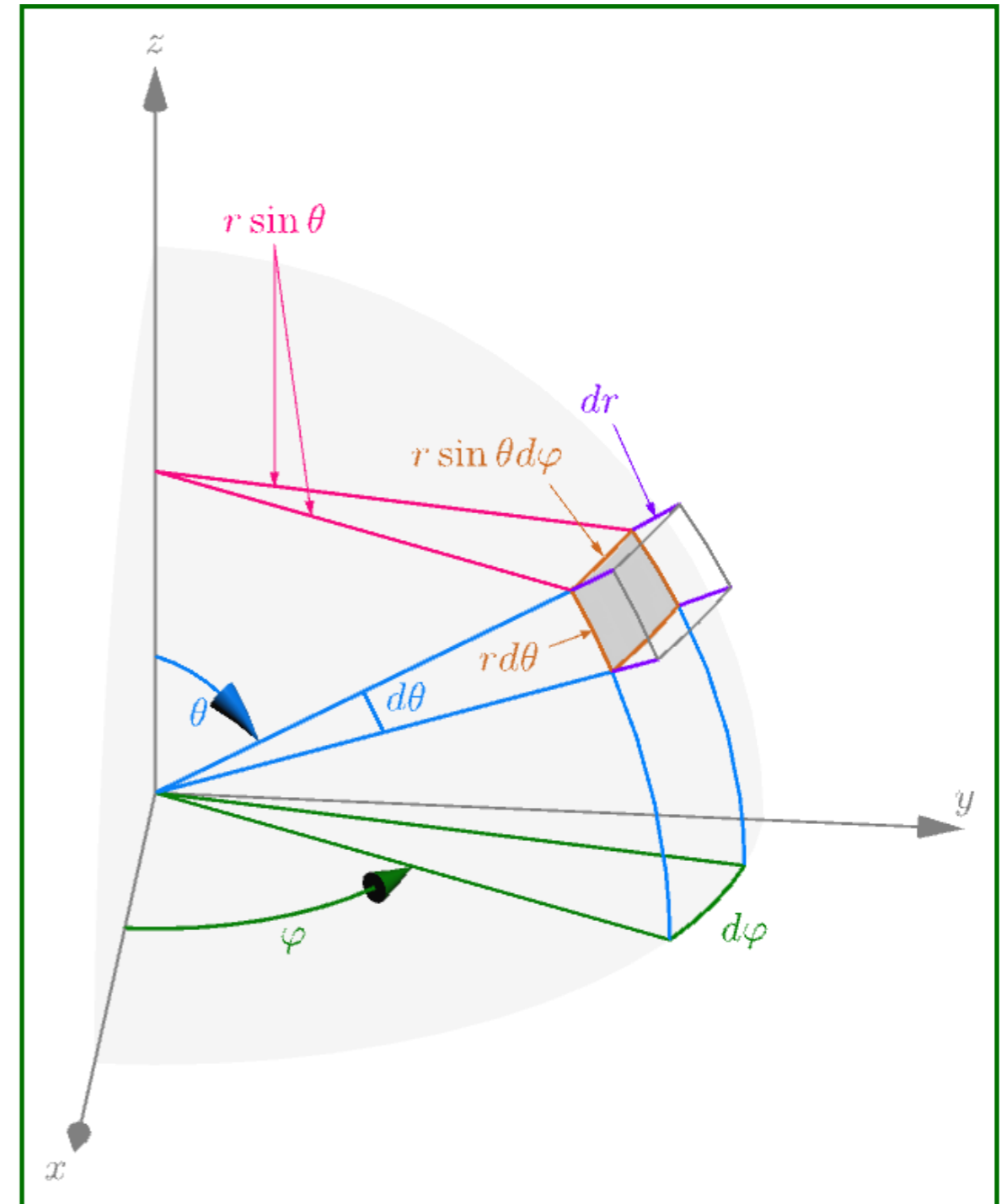
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Coordenadas esféricas



Análise vetorial

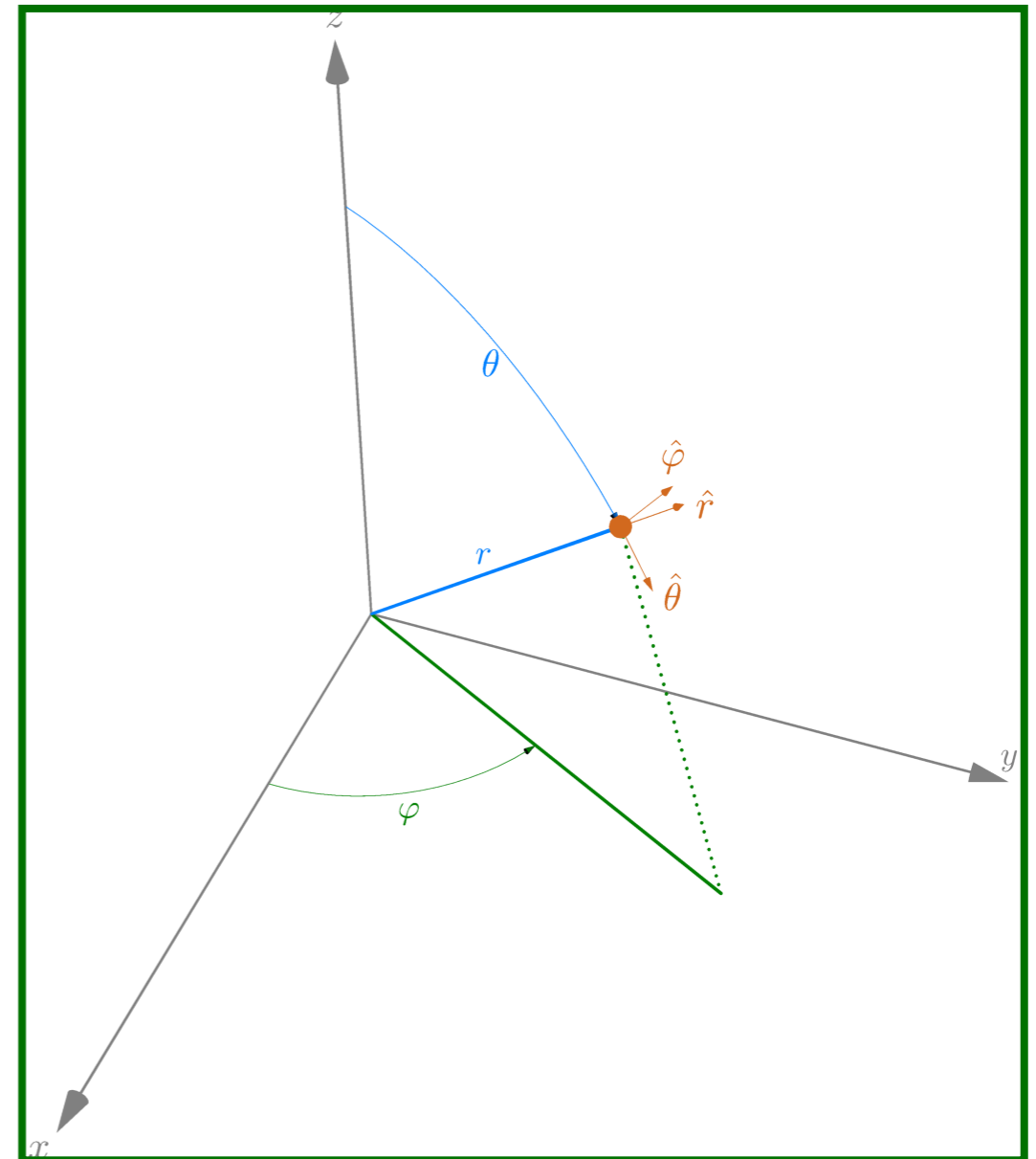
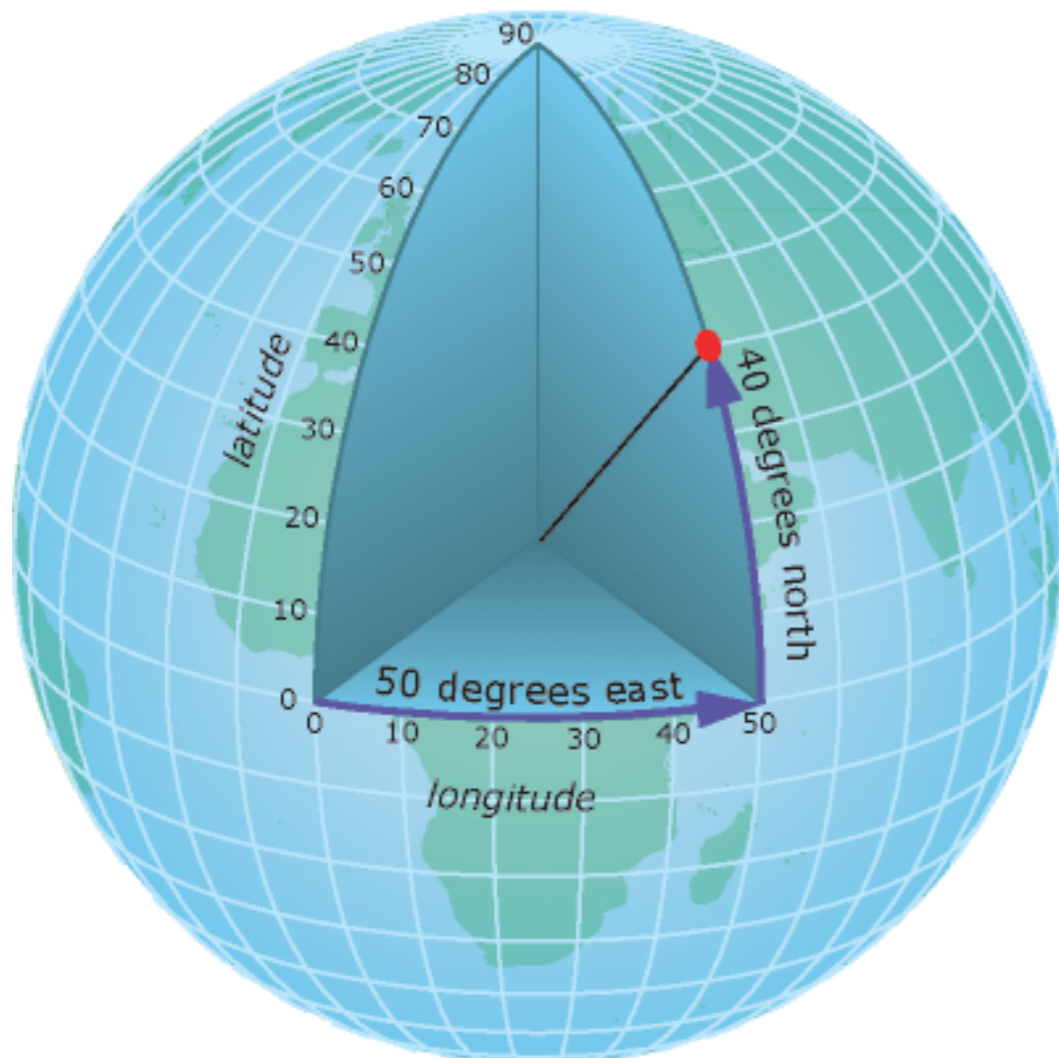
Coordenadas esféricas



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Coordenadas esféricas

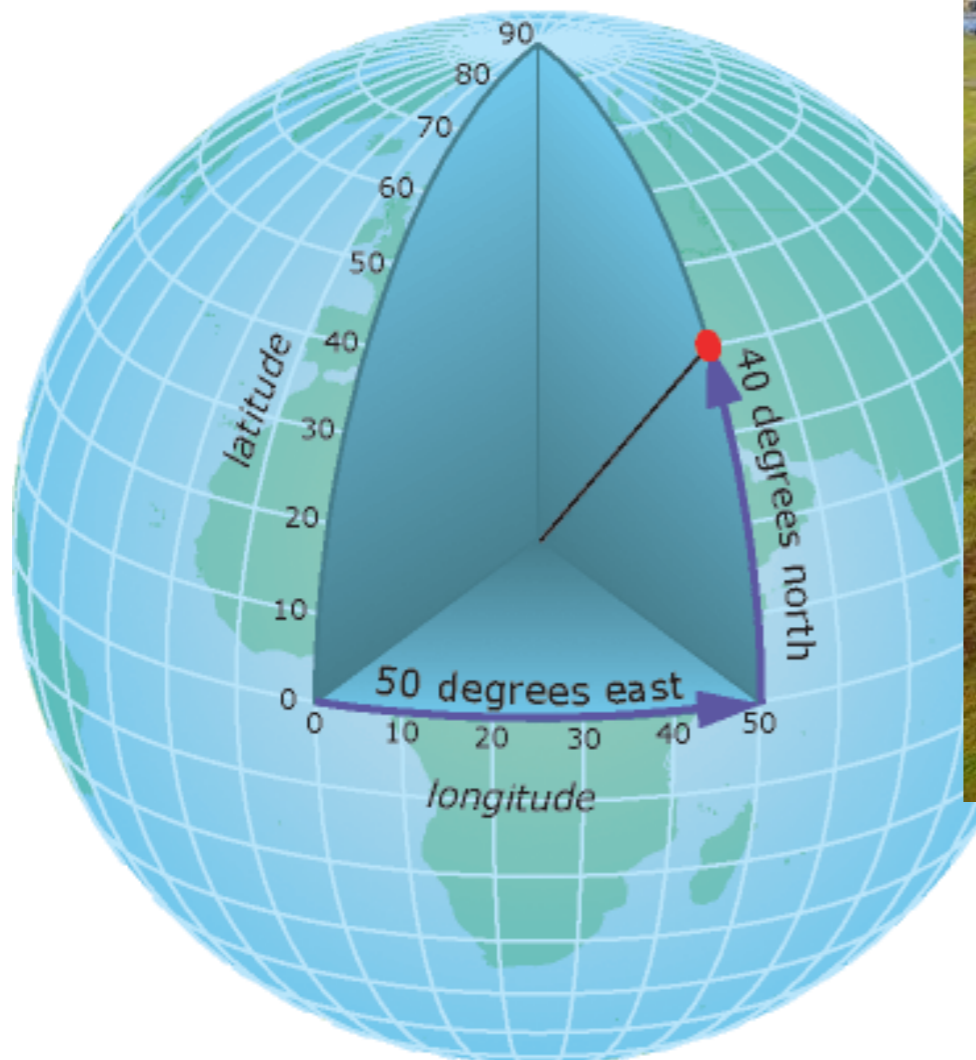
$$\int_{\vec{a}}^{\vec{b}} \vec{\nabla} T \cdot d\vec{\ell} = T(\vec{b}) - T(\vec{a})$$



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Coordenadas esféricas

$$\int_{\vec{a}}^{\vec{b}} \vec{\nabla} T \cdot d\vec{\ell} = T(\vec{b}) - T(\vec{a})$$



Pratique o que aprendeu

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

Coordenadas GPS

Trevo São Carlos:

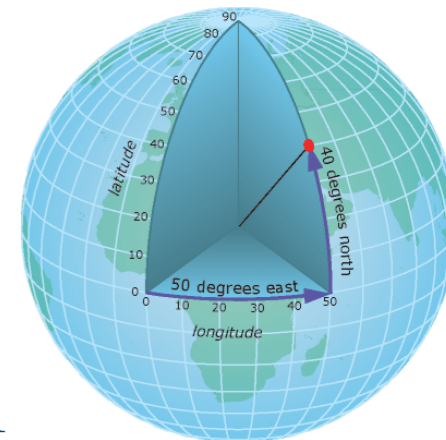
$$22.01 \quad \theta' = 22.01$$

$$47.90 \quad \phi = 47.90$$

Ponte Piqueri:

$$23.51 \quad \theta' = 23.51$$

$$46.72 \quad \phi = 46.72$$



Qual é a distância?

Pratique o que aprendeu

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

Coordenadas GPS

Trevo São Carlos:

$$\begin{array}{ll} 22.01 & \theta' = 22.01 \\ 47.90 & \phi = 47.90 \end{array}$$

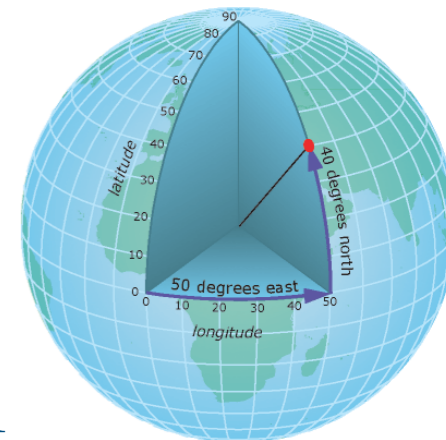
Ponte Piqueri:

$$\begin{array}{ll} 23.51 & \theta' = 23.51 \\ 46.72 & \phi = 46.72 \end{array}$$

$$d\vec{\ell} = R d\theta' \hat{\theta} + R \cos \theta' d\phi \hat{\phi}$$

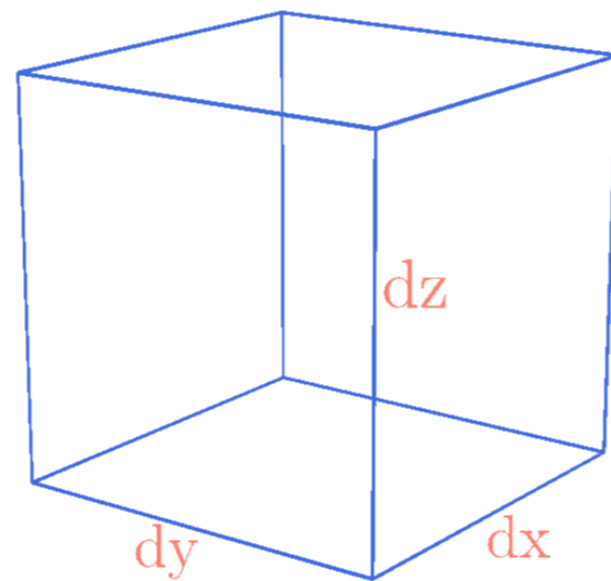
$$R = 6.37 \times 10^6 \text{ m}$$

$$d\ell = R \sqrt{(d\theta')^2 + \cos^2 \theta' (d\phi)^2} \Rightarrow d\ell = 206 \text{ km}$$

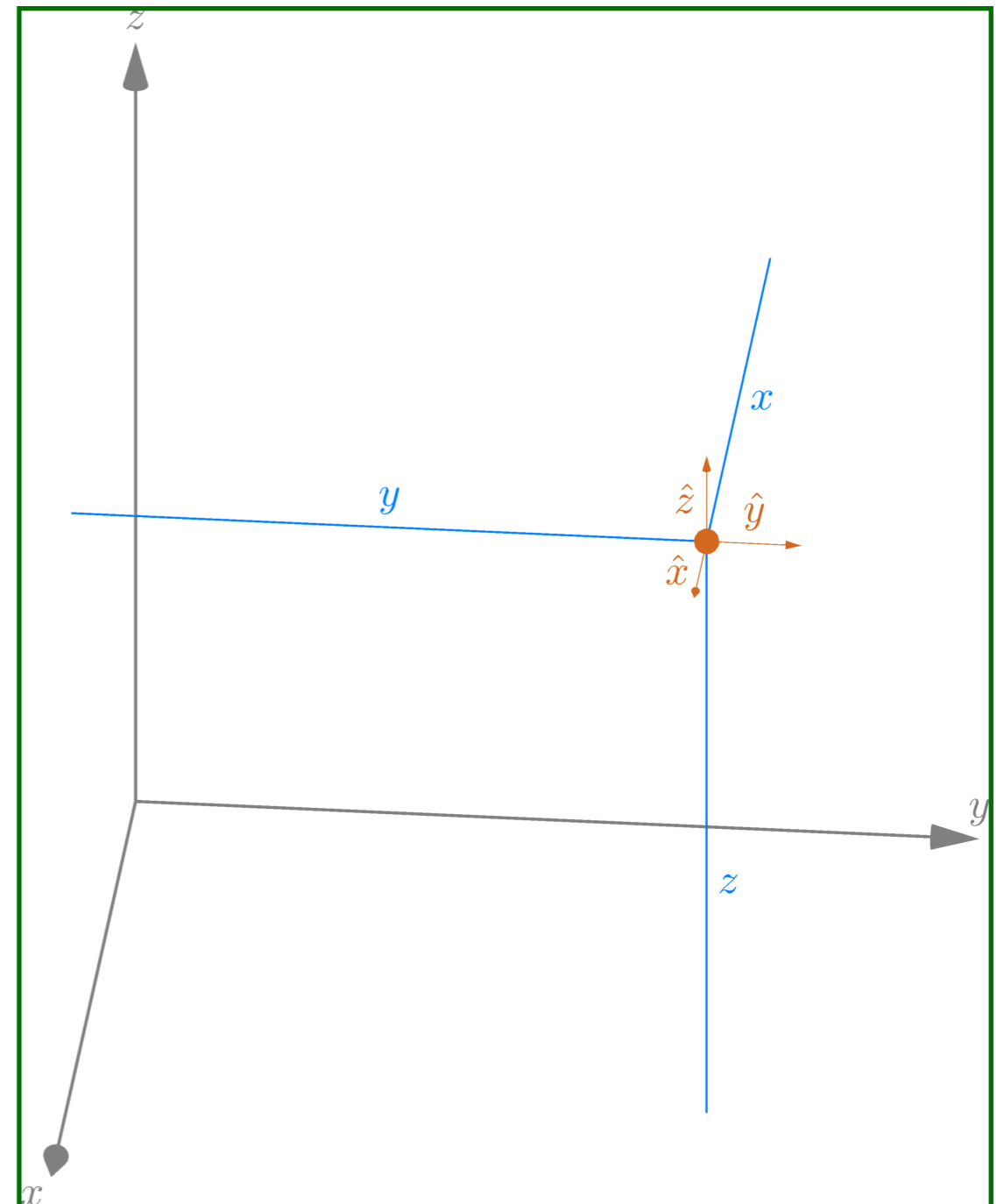


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Coordenadas cartesianas



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



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Coordenadas cartesianas

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

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

$$\vec{\nabla} T = \frac{\partial T}{\partial x} \hat{x} + \frac{\partial T}{\partial y} \hat{y} + \frac{\partial T}{\partial z} \hat{z}$$

