

# Coordenadas cilíndricas

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

$$\vec{\nabla} T = \frac{\partial T}{\partial s} \hat{s} + \frac{1}{s} \frac{\partial T}{\partial \phi} \hat{\phi} + \frac{\partial T}{\partial z} \hat{z}$$

$$\vec{\nabla} \cdot \vec{v} = \frac{1}{s} \frac{\partial (sv_s)}{\partial s} + \frac{1}{s} \frac{\partial v_\phi}{\partial \phi} + \frac{\partial v_z}{\partial z}$$

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

$$\nabla^2 T = \frac{1}{s} \frac{\partial}{\partial s} \left( s \frac{\partial T}{\partial s} \right) + \frac{1}{s^2} \frac{\partial^2 T}{\partial \phi^2} + \frac{\partial^2 T}{\partial z^2}$$

