- Gradiente, divergencia, rotor y laplaciano en coord. cartesianas

$$\vec{\nabla}\, V \;= \frac{\partial V}{\partial x}\hat{x} + \frac{\partial V}{\partial y}\hat{y} + \frac{\partial V}{\partial z}\hat{z}$$

$$\nabla^2\, V = \frac{\partial^2 V}{\partial^2 x} + \frac{\partial^2 V}{\partial^2 y} + \frac{\partial^2 V}{\partial^2 z}$$

$$\vec{\nabla} \cdot \vec{\mathbf{A}} = \frac{\partial A_x}{\partial x} + \frac{\partial A_y}{\partial y} + \frac{\partial A_z}{\partial z}$$

$$\vec{\nabla} \times \vec{\mathbf{A}} = [\frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z}]\hat{x} \quad + \quad [\frac{\partial A_x}{\partial z} - \frac{\partial A_z}{\partial x}]\hat{y} \quad + \quad [\frac{\partial A_y}{\partial x} - \frac{\partial A_x}{\partial y}]\hat{z}$$

- Gradiente, divergencia, rotor y laplaciano en coordenadas cilíndricas

$$\vec{\nabla}\, V \;= \frac{\partial V}{\partial r}\hat{r} + \frac{1}{r}\frac{\partial V}{\partial \phi}\hat{\phi} + \frac{\partial V}{\partial z}\hat{z}$$

$$\nabla^2\, V = \frac{1}{r}\frac{\partial}{\partial r}\big(r\frac{\partial V}{\partial r}\big) + \frac{1}{r^2}\frac{\partial^2 V}{\partial^2 \phi} + \frac{\partial^2 V}{\partial^2 z}$$

$$\vec{\nabla} \cdot \vec{\mathbf{A}} = \frac{1}{r}\frac{\partial (rA_r)}{\partial r} + \frac{1}{r}\frac{\partial A_\phi}{\partial \phi} + \frac{\partial A_z}{\partial z}$$

$$\vec{\nabla} \times \vec{\mathbf{A}} = [\frac{1}{r}\frac{\partial A_z}{\partial \phi} - \frac{\partial A_\phi}{\partial z}]\hat{r} \quad + \quad [\frac{\partial A_r}{\partial z} - \frac{\partial A_z}{\partial r}]\hat{\phi} \quad + \quad [\frac{1}{r}\frac{\partial (rA_\phi)}{\partial r} - \frac{1}{r}\frac{\partial A_r}{\partial \phi}]\hat{z}$$

- Gradiente, divergencia, rotor y laplaciano en coordenadas esféricas

$$\vec{\nabla}\, V \;= \frac{\partial V}{\partial r}\hat{r} + \frac{1}{r}\frac{\partial V}{\partial \theta}\hat{\theta} + \frac{1}{r\sin\theta}\frac{\partial V}{\partial \phi}\hat{\phi}$$

$$\nabla^2\, V = \frac{1}{r}\frac{\partial^2 (rV)}{\partial r^2} + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial \theta}\big(\sin\theta\frac{\partial V}{\partial \theta}\big) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2 V}{\partial^2 \phi}$$

$$\vec{\nabla} \cdot \vec{\mathbf{A}} = \frac{1}{r^2}\frac{\partial (r^2 A_r)}{\partial r} + \frac{1}{r\sin\theta}\frac{\partial (\sin\theta A_\theta)}{\partial \theta} + \frac{1}{r\sin\theta}\frac{\partial A_\varphi}{\partial \varphi}$$

$$\vec{\nabla} \times \vec{\mathbf{A}} = [\frac{1}{r\sin\theta}\big(\frac{\partial (A_\phi \sin\theta)}{\partial \theta} - \frac{\partial A_\theta}{\partial \phi}]\hat{r} \quad + \quad [\frac{1}{r}\big(\frac{\partial A_r}{\sin\theta\partial\phi} - \frac{\partial (rA_\phi)}{\partial r}\big)]\hat{\theta} \quad +$$

$$[\frac{1}{r}\big(\frac{\partial (rA_\theta)}{\partial r} - \frac{\partial A_r}{\partial \theta}\big)]\hat{\phi}$$