• Relaciones vectoriales que deberíamos saber deducir

$$\vec{\nabla}\ (\mathbf{A}\cdot\mathbf{B})\ = \mathbf{B}\times(\vec{\nabla}\times\mathbf{A}) + \mathbf{A}\times(\vec{\nabla}\times\mathbf{B}) + (\mathbf{B}\cdot\vec{\nabla})\mathbf{A} + (\mathbf{A}\cdot\vec{\nabla})\mathbf{B}$$

$$\vec{\nabla}\ \cdot(\mathbf{A}+\mathbf{B})\ = \vec{\nabla}\ \cdot\mathbf{A} + \vec{\nabla}\ \cdot\mathbf{B}$$

$$\vec{\nabla}\ \cdot(\mu\mathbf{A})\ = \mathbf{A}\cdot\vec{\nabla}\ \mu + \mu\vec{\nabla}\ \cdot\mathbf{A}$$

$$\vec{\nabla}\ \cdot(\mathbf{A}\times\mathbf{B})\ = \mathbf{B}\vec{\nabla}\ \times\mathbf{A} - \mathbf{A}\vec{\nabla}\ \times\mathbf{B}$$

$$\vec{\nabla}\ \times(\mathbf{A}+\mathbf{B})\ = \vec{\nabla}\ \times\mathbf{A} + \vec{\nabla}\ \times\mathbf{B}$$

$$\vec{\nabla}\ \times(\mu\mathbf{A})\ = (\vec{\nabla}\ \mu)\times\mathbf{A} + \mu(\vec{\nabla}\ \times\mathbf{A})$$

$$\vec{\nabla}\ \times(\mathbf{A}\times\mathbf{B})\ = (\vec{\nabla}\ \cdot\mathbf{B})\mathbf{A} - (\vec{\nabla}\ \cdot\mathbf{A})\mathbf{B} + (\mathbf{B}\cdot\vec{\nabla}\ )\mathbf{A} - (\mathbf{A}\cdot\vec{\nabla}\ )\mathbf{B}$$

$$\vec{\nabla}\ \times(\vec{\nabla}\ \times\mathbf{A})\ = \vec{\nabla}\ (\vec{\nabla}\ \cdot\mathbf{A}) - (\vec{\nabla}^2\ \mathbf{A})$$

donde

$$(\mathbf{A}\cdot\vec{\nabla}\ )\mathbf{B} = \hat{x}(A_x\tfrac{\partial B_x}{\partial x} + A_y\tfrac{\partial B_x}{\partial y} + A_z\tfrac{\partial B_x}{\partial z}\ ) +$$

$$\hat{y}(A_x\tfrac{\partial B_y}{\partial x} + A_y\tfrac{\partial B_y}{\partial y} + A_z\tfrac{\partial B_y}{\partial z}\ ) +$$

$$\hat{z}(A_x\tfrac{\partial B_z}{\partial x} + A_y\tfrac{\partial B_z}{\partial y} + A_z\tfrac{\partial B_z}{\partial z}\ )$$

y

$$\vec{\nabla}\ R = -\vec{\nabla}^{\,'}R = \tfrac{\vec{R}}{R} = \hat{R}$$

$$\vec{\nabla}\ (R^n) = -\vec{\nabla}^{\,'}R^n = nR^{n-1}\hat{R}$$

$$\vec{\nabla}\ (\tfrac{1}{R}) = -\vec{\nabla}^{\,'}(\tfrac{1}{R}) = -\tfrac{\hat{R}}{R^2} = -\tfrac{\vec{R}}{R^3}$$

$$\vec{\nabla}^{\,2}(\tfrac{1}{R}) = -(\tfrac{3}{R^3}) + (\tfrac{3R^2}{R^5}) = 0 \qquad (R\neq 0)$$

$$\vec{\nabla}\ \cdot(\tfrac{\vec{R}}{R^3}) = 0\ \ y\ \ \vec{\nabla}^{\,'}\cdot(\tfrac{\vec{R}}{R^3}) = 0 \qquad (R\neq 0)$$