

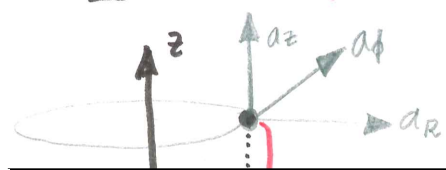
Sistemas de Coordenadas

	<u>Cartesianas</u> (x, y, z)	<u>Cilíndricas</u> (r, φ, z)	<u>Esféricas</u> (R, θ, φ)
<u>Coefficientes Métricos</u>	$h_1 = 1$ $h_2 = 1$ $h_3 = 1$	$h_1 = 1$ $h_2 = r$ $h_3 = 1$	$h_1 = 1$ $h_2 = R$ $h_3 = R \sin \theta$
<u>Diferencial de Volumen</u>	dx dy dz	r · dr dφ dz	R ² sin θ dr dθ dφ
<u>Vector</u> (A ₁ , A ₂ , A ₃)	(A _x , A _y , A _z)	(A _r , A _φ , A _z)	(A _R , A _θ , A _φ)

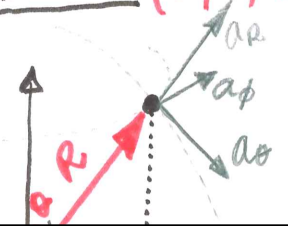
CARTESIANAS (x, y, z)



CILINDRICAS (r, φ, z)



ESFERICAS (R, θ, φ)



Cartagena99

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$y = r \cdot \sin \phi$

$z = R \cdot \cos \theta$

Gradiente $\vec{\nabla} F$

*Operador
nabla*
$$\vec{\nabla} = \left(\frac{\partial}{h_1 \partial u_1}, \frac{\partial}{h_2 \partial u_2}, \frac{\partial}{h_3 \partial u_3} \right)$$

Divergencia

$$\vec{\nabla} \cdot \vec{A} = \frac{1}{h_1 h_2 h_3} \left[\frac{\partial}{\partial u_1} (h_2 h_3 A_1) + \frac{\partial}{\partial u_2} (h_1 h_3 A_2) + \frac{\partial}{\partial u_3} (h_1 h_2 A_3) \right]$$

Rotacional

$$\vec{\nabla} \wedge \vec{A} = \frac{1}{h_1 h_2 h_3} \begin{vmatrix} i h_1 & j h_2 & k h_3 \\ \frac{\partial}{\partial u_1} & \frac{\partial}{\partial u_2} & \frac{\partial}{\partial u_3} \\ h_1 A_1 & h_2 A_2 & h_3 A_3 \end{vmatrix}$$



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