Dado el campo $\bar{A} = x\bar{i} + (2 - yz)\bar{j} + \left(\frac{z^2}{2} - 1\right)\bar{k}$

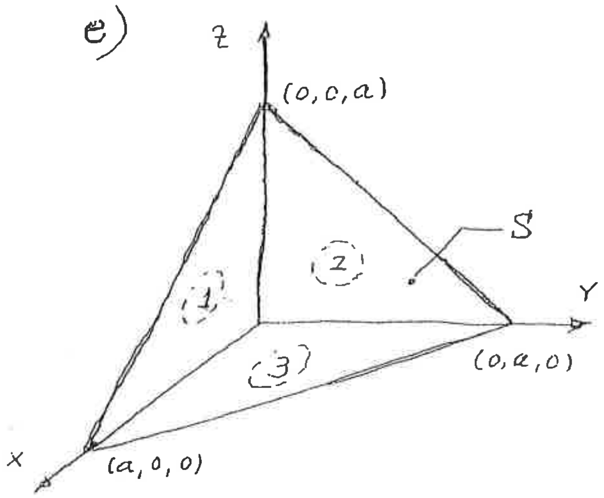
a) $\nabla \cdot \bar{A} = \dfrac{\partial A_x}{\partial x} + \dfrac{\partial A_y}{\partial y} + \dfrac{\partial A_z}{\partial z} = 1 - z + z = 1$ (1)

b) $\nabla \wedge \bar{A} = \begin{vmatrix} \bar{i} & \bar{j} & \bar{k} \\ \partial/\partial x & \partial/\partial y & \partial/\partial z \\ x & 2 - yz & \frac{z^2}{2} - 1 \end{vmatrix} = y\bar{i}$

c) $\nabla \wedge (\nabla \wedge \bar{A}) = \left(\dfrac{\partial}{\partial x}\bar{i} + \dfrac{\partial}{\partial y}\bar{j} + \dfrac{\partial}{\partial z}\bar{k}\right) \wedge y\bar{i} = -\bar{k}$ (en cualquier pun

d) $\phi = \displaystyle\int_{S\,\text{esférica}} \bar{A} \cdot d\bar{S} \underset{\text{T. Gauss}}{=} \int_V (\nabla \cdot \bar{A})\, dv \underset{\text{de (1)}}{=} V_{\text{esfera}} = 36\pi a^3$

e)



$$\phi = \int_S \bar{A} \cdot d\bar{S} = \int_{\substack{\text{sup.}\\ \text{tetraedro}}} \bar{A} \cdot d\bar{S} - \int_{S_1} \bar{A} \cdot d\bar{S} - \int_{S_2} \bar{A} \cdot d\bar{S} - \int_{S_3} \bar{A} \cdot d$$ (

donde:

$$\int_{\substack{\text{sup.}\\ \text{tetraedro}}} \bar{A} \cdot d\bar{S} \underset{\text{T. Gauss}}{=} \int_V (\nabla \cdot \bar{A})\, dv \underset{\text{de (1)}}{=} V_{\text{tetr}} = \frac{1}{6} a^3$$

$$\int_{S_1 (y=0)} \left[x\bar{i} + (2 - \cancel{y}z)\bar{j} + \left(\frac{z^2}{2} - 1\right)\bar{k}\right] \cdot dS(-\bar{j}) = -2S_1 = -a^2$$

$$\int_{S_2 (x=0)} \left[\cancel{x}\bar{i} + (2 - yz)\bar{j} + \left(\frac{z^2}{2} - 1\right)\bar{k}\right] \cdot dS(-\bar{i}) = 0$$

$$\int_{S_3 (z=0)} \left[x\bar{i} + (2 - y\cancel{z})\bar{j} + \left(\frac{\cancel{z}^2}{2} - 1\right)\bar{k}\right] \cdot dS(-\bar{k}) = S_3 = \frac{1}{2} a^2$$

entrando con estos valores en (2)

$$\therefore \quad \phi = \int_S \bar{A} \cdot d\bar{S} = \frac{1}{6} a^3 + a^2 - \frac{1}{2} a^2 = \frac{1}{6} a^3 + \frac{1}{2} a^2$$