

$$3. \quad \vec{D} = (x^2 + z^2) \vec{a}_x + (4xy) \vec{a}_y + (5z^3) \vec{a}_z$$

$$\begin{cases} 0 \leq x \leq 3 \\ 0 \leq y \leq 5 \\ 2 \leq z \leq 6 \end{cases}$$

Parte a.

$$\nabla \cdot \vec{D} = \frac{\partial}{\partial x} (x^2 + z^2) + \frac{\partial}{\partial y} (4xy) + \frac{\partial}{\partial z} (5z^3)$$

$$\nabla \cdot \vec{D} = 2x + 4y + 15z^2$$

$$\nabla \cdot \vec{D} = 6x + 15z^2$$

$$\rho_v = 6x + 15z^2$$

$$Q = \iiint \rho_v dV = \int_2^6 \int_0^5 \int_0^3 (6x + 15z^2) dx dy dz$$

$$Q = \int_2^6 \int_0^5 \left[ 3x^2 + 15z^2 x \right]_0^3 dy dz$$

$$Q = \int_2^6 \int_0^5 (27 + 45z^2) dy dz$$

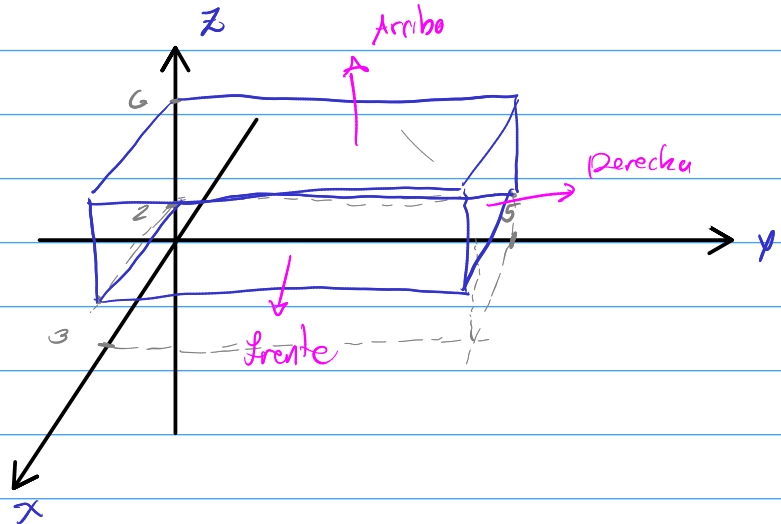
$$Q = \int_2^6 (27y + 45z^2 y) \Big|_0^5 dz$$

$$Q = \int_2^6 (135 + 225z^2) dz = \underline{16140 \text{ nC}} \quad \text{R}$$

Parte b

$$\vec{D} = (x^2 + z^2) \vec{a}_x + (4xy) \vec{a}_y + (5z^3) \vec{a}_z$$

$$\begin{cases} 0 \leq x \leq 3 \\ 0 \leq y \leq 5 \\ 2 \leq z \leq 6 \end{cases}$$



frente

$$\begin{aligned} \text{frente} \quad dS &= dydz \vec{a}_x \\ \text{atras} \quad dS &= -dydz \vec{a}_x \end{aligned}$$

$$Q_1 = \iint D_{x=3} dydz$$

$$Q_1 = \int_2^6 \int_0^5 (9 + z^2) dy dz$$

$$Q_1 = \frac{1580}{3}$$

$$Q_2 = \iint -D_{x=0} dydz$$

$$Q_2 = - \int_2^6 \int_0^5 z^2 dy dz$$

$$Q_2 = -\frac{1040}{3}$$

Derecha

$$ds = dx dz \vec{a}_y$$

$$\text{izquierda} = -dx dz \vec{a}_y$$

$$Q_3 = \int \int D_y = 5 \, dx dz$$

$$Q_3 = \int_2^6 \int_0^3 20x \, dx dz$$

$$Q_3 = 360$$

$$Q_4 = - \int \int D_y = 0 \, dx dz$$

$$Q_4 = - \int_2^6 \int_0^3 0 \, dx dz$$

$$Q_4 = 0$$

Arriba

$$ds = dx dy \vec{a}_z$$

Abajo

$$ds = -dx dy \vec{a}_z$$

$$Q_5 = \int \int D_z = 6 \, dx dy$$

$$Q_5 = \int_0^5 \int_0^3 1080 \, dx dy$$

$$Q_5 = 16200$$

$$Q_6 = - \int \int D_z = 2 \, dx dy$$

$$Q_6 = - \int_0^5 \int_0^3 40 \, dx dy$$

$$Q_6 = -600$$

$$Q_{\text{max}} = Q_1 + Q_2 + Q_3 + Q_4 + Q_5 + Q_6$$

$$Q_{\text{total}} = 16200 - 600 - 180 + 360$$

$$Q_{\text{total}} = 16140 \, \text{nC}$$
