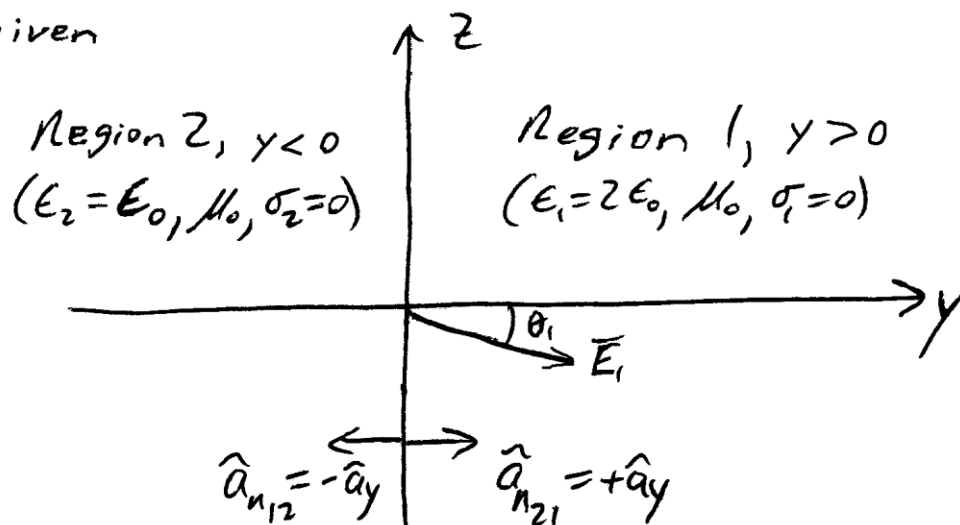


ex. Given



Where  $\vec{E}_2 = 100\hat{a}_x + 200\hat{a}_y - 300\hat{a}_z$  V/m

and  $\vec{D}_1 = 1.771\hat{a}_x + 6.2\hat{a}_y - 5.312\hat{a}_z$  nC/m<sup>2</sup>

Find  $\vec{D}_2, \vec{E}_1, \rho_s, \theta_i$  (wrt y-axis)

$$\vec{D}_2 = \epsilon_2 \vec{E}_2 = \epsilon_0 \vec{E}_2 = 0.8854\hat{a}_x + 1.7708\hat{a}_y - 2.6562\hat{a}_z \text{ nC/m}^2$$

$$\vec{E}_1 = \frac{\vec{D}_1}{\epsilon_1} = \frac{(1.771\hat{a}_x + 6.2\hat{a}_y - 5.312\hat{a}_z) \times 10^{-9}}{2(8.854 \times 10^{-12})} \text{ C/m}^2$$

$$\vec{E}_1 = 100\hat{a}_x + 350.1\hat{a}_y - 300\hat{a}_z \text{ V/m}$$

check  $\Rightarrow \vec{E}_{1t} = \vec{E}_{2t}$ ?  $\Rightarrow$  yes,  $\hat{a}_x$  &  $\hat{a}_z$  components are equal

ex. cont.

$$D_{1n} - D_{2n} = \rho_s \quad \text{or} \quad \hat{a}_{n21} \cdot (\bar{D}_1 - \bar{D}_2) = \rho_s$$

$$\rho_s = \hat{a}_y \cdot \left[ (1.771 - 0.8954) \hat{a}_x + (6.2 - 1.7708) \hat{a}_y + (-5.312 - 2.654) \hat{a}_z \right] \times 10^{-9} \frac{C}{m^2}$$

$$\rho_s = 4.43 \times 10^{-9} \frac{C}{m^2} = 4.43 \frac{nC}{m^2}$$


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$\theta_1$

$$\bar{E}_1 \cdot \hat{a}_{n21} = |\bar{E}_1| (1) \cos \theta_1$$

$$\bar{E}_1 \cdot \hat{a}_y = 350.1$$

$$|\bar{E}_1| = \sqrt{100^2 + 350.1^2 + 300^2} = 471.77$$

$$350.1 = 471.77 \cos \theta_1$$

$$\Rightarrow \theta_1 = \cos^{-1} \left( \frac{350.1}{471.77} \right) = \underline{\underline{42.09^\circ}}$$