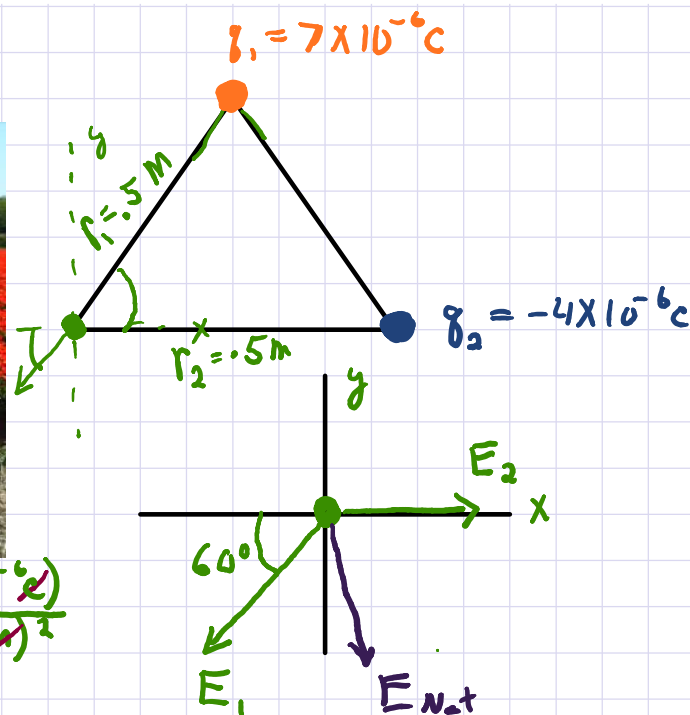
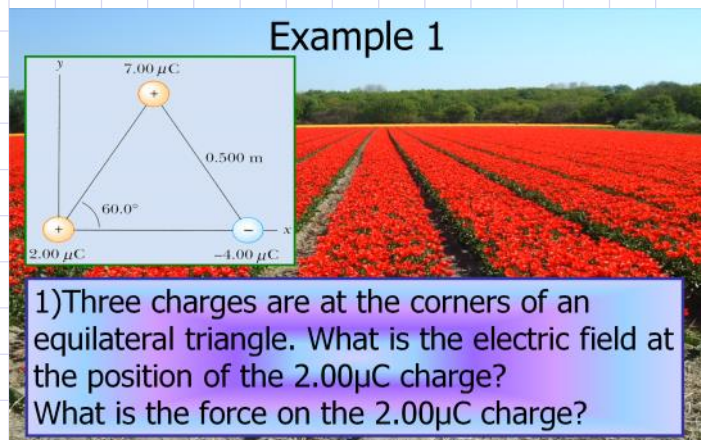


Example 1

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$$E_1 = k \frac{q_1}{r_1^2} = (9 \times 10^9 \text{ N} \frac{\text{m}^2}{\text{C}^2}) \frac{(7 \times 10^{-6} \text{ C})}{(.5 \text{ m})^2}$$

$$E_1 = 2.52 \times 10^5 \text{ N/C}$$

$$E_2 = k \frac{q_2}{r_2^2} = (9 \times 10^9 \text{ N} \frac{\text{m}^2}{\text{C}^2}) \frac{(4 \times 10^{-6} \text{ C})}{(.5 \text{ m})^2}$$

$$E_2 = 1.44 \times 10^5 \text{ N/C}$$

$$\Sigma E_x = E_2 - E_1 \cos(60^\circ) = (1.44 \times 10^5 \text{ N/C}) - (2.52 \times 10^5 \text{ N/C}) \cos(60^\circ)$$

$$\Sigma E_x = 1.8 \times 10^4 \text{ N/C}$$

$$\Sigma E_y = -E_1 \sin(60^\circ) = (2.52 \times 10^5 \text{ N/C}) \sin(60^\circ)$$

$$\Sigma E_y = -2.18 \times 10^5 \text{ N/C}$$

$$\theta = \tan^{-1} \left(\frac{\Sigma E_y}{\Sigma E_x} \right) = \tan^{-1} \left(\frac{-2.18 \times 10^5 \text{ N/C}}{1.8 \times 10^4 \text{ N/C}} \right) = -85.3^\circ$$

below +x axis

$$|E_{\text{net}}| = \sqrt{(\Sigma E_x)^2 + (\Sigma E_y)^2}$$

$$|E_{\text{net}}| = \sqrt{(1.8 \times 10^4 \text{ N/C})^2 + (-2.18 \times 10^5 \text{ N/C})^2}$$

$$|E_{\text{net}}| = 2.19 \times 10^5 \text{ N/C}$$

$$F = E_{\text{net}} q_2$$

← $q_2 = 2 \times 10^{-6} \text{ C}$

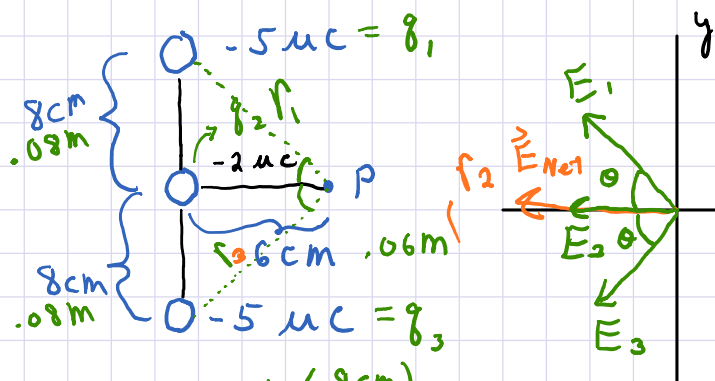
$$F = (2.19 \times 10^5 \text{ N/C})(2 \times 10^{-6} \text{ C})$$

$$F = 0.438 \text{ N} \quad \text{at } 85.3^\circ \text{ below (+) x axis}$$



Example 2 #43 ch 17

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$$\theta = \tan^{-1} \left(\frac{8 \text{ cm}}{6 \text{ cm}} \right) = 53.13^\circ$$

$$r_1 = r_3 = \sqrt{(0.08 \text{ m})^2 + (0.06 \text{ m})^2}$$

$$r_1 = r_3 = 0.1 \text{ m}$$

$$\sum E_x = -E_2 - E_1 \cos \theta - E_3 \cos \theta$$

$$\sum E_x = -E_2 - 2E \cos \theta$$

$$\sum E_x = -(5 \times 10^6 \text{ N/C}) - 2(4.5 \times 10^6 \text{ N/C}) \cos(53.13^\circ) = -1.64 \times 10^7 \text{ N/C}$$

$$\sum E_y = E_1 \sin \theta - E_3 \sin \theta = 0$$

$$E_1 = k \frac{q_1}{r_1^2}$$

$$E_1 = (9 \times 10^9 \text{ N} \frac{\text{m}^2}{\text{C}^2}) \frac{(5 \times 10^{-6} \text{ C})}{(0.1 \text{ m})^2}$$

$$E_1 = 4.5 \times 10^6 \text{ N/C}$$

$$E_3 = E_1 = E$$

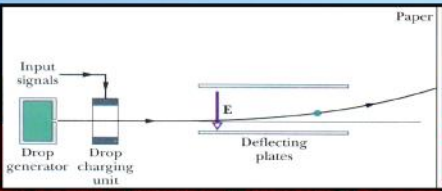
$$E_2 = k \frac{q_2}{r_2^2}$$

$$E_2 = (9 \times 10^9 \text{ N} \frac{\text{m}^2}{\text{C}^2}) \frac{(2 \times 10^{-6} \text{ C})}{(0.06 \text{ m})^2}$$

$$E_2 = 5 \times 10^6 \text{ N/C}$$

Example 3

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Example 3

3) An ink drop with a mass m of $1.3 \times 10^{-10} \text{ kg}$ and a negative charge of magnitude $q = 1.5 \times 10^{-13} \text{ C}$ enters the region between the plates, initially moving along the x -axis with speed $v_x = 18 \text{ m/s}$. The length L of the plates is 1.6 cm . The plates are charged and thus produce an electric field of magnitude $1.4 \times 10^6 \text{ N/C}$. What is the vertical deflection of the drop at the far edge of the plates?

$$\begin{aligned}
 &v_{y,0} = 0 \quad E = 1.4 \times 10^6 \text{ N/C} \\
 &\uparrow a_y \quad \rightarrow 18 \text{ m/s} = v_x \quad \Delta y \\
 &\Delta x = .016 \text{ m} \\
 &q = -1.5 \times 10^{-13} \text{ C} \\
 &m = 1.3 \times 10^{-10} \text{ kg}
 \end{aligned}$$

$$v_y = v_{y,0} + a_y t$$

$$v_y^2 = v_{y,0}^2 + 2a_y \Delta y$$

$$\Delta y = \left[\frac{v_y + v_{y,0}}{2} \right] t$$

$$\Delta y = \cancel{v_{y,0} t} + \frac{1}{2} a_y t^2$$

$$\Delta y = \frac{1}{2} a_y t^2$$

$$\Delta x = v_x t$$

$$t = \frac{\Delta x}{v_x}$$

$$t = \frac{.016 \text{ m}}{18 \text{ m/s}}$$

$$t = 8.89 \times 10^{-4} \text{ s}$$

$$a = \frac{Eq}{m}$$

$$a = \frac{(1.4 \times 10^6 \text{ N/C})(1.5 \times 10^{-13} \text{ C})}{1.3 \times 10^{-10} \text{ kg}}$$

$$\Delta y = \frac{1}{2} (1.6 \times 10^3 \text{ m/s}^2) (8.89 \times 10^{-4} \text{ s})^2 \quad a = 1.6 \times 10^3 \text{ m/s}^2$$

$$\Delta y = 6.3 \times 10^{-4} \text{ m}$$