

$$q_1 = 3 \text{ nC} \quad (0, -12) \text{ cm}$$

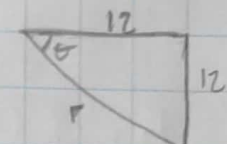
$$q_2 = 2 \text{ nC} \quad (12, 0)$$

$$q_3 = -4 \text{ nC} \quad (12, -12)$$

$$\vec{E} = \vec{E}_1 + \vec{E}_2 + \vec{E}_3$$

a)

$$E_1 = \frac{k q_1}{r_1^2} = \frac{k (3 \text{ n})}{(0.12)^2} = 1875 \text{ N/C} \quad (+y)$$



$$\theta = \tan^{-1}\left(\frac{-12}{12}\right)$$

$$E_2 = \frac{k q_2}{r_2^2} = \frac{k (2 \text{ n})}{(0.12)^2} = 1250 \text{ N/C} \quad (-x) \quad \theta = -45^\circ + 360^\circ$$

$$\theta = 315^\circ$$

$$E_3 = \frac{k q_3}{(r_3)^2} = \frac{k (4 \text{ n})}{(\sqrt{(0.12)^2 + (0.12)^2})^2} = 1250 \text{ N/C}$$

$$E_{3y} = 1250 \sin 315^\circ = 883.88 \quad (-y)$$

$$E_{3x} = 1250 \cos 315^\circ = 883.88 \quad (+x)$$

$$\vec{E}_R = (-1250 + 883.88) \hat{i} + (1875 - 883.88) \hat{j}$$

$$\vec{E}_R = -366.12 \hat{i} + 991.12 \hat{j}$$

$$|\vec{E}_R| = \sqrt{(-366.12)^2 + (991.12)^2} = 1056.58 \text{ N/C}$$

b) $V_1 = \frac{k q_1}{r_1} = \frac{k (3 \text{ n})}{(0.12)} = 225 \text{ V}$

$$E_R = 1057 \text{ N/C}$$

$$V_2 = \frac{k q_2}{r_2} = \frac{k (2 \text{ n})}{0.12} = 150 \text{ V}$$

$$V_R = 225 + 150 = 375 \text{ V}$$

$$V_R = 167.87$$

$$V_3 = \frac{k q_3}{r_3} = \frac{k (-4 \text{ n})}{\sqrt{(0.12)^2 + (0.12)^2}} = -212.13 \text{ V}$$

$$V_R = 163 \text{ V}$$

$$U_3 = \frac{k (2 \text{ n}) (-4 \text{ n})}{(0.12)} = -6 \times 10^{-7} \text{ J}$$

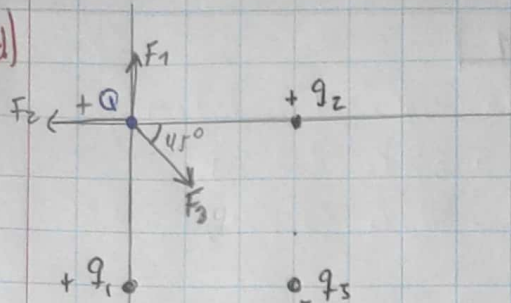
c) $U_1 = \frac{k (3 \text{ n}) (2 \text{ n})}{\sqrt{(0.12)^2 + (0.12)^2}} = 3.18 \times 10^{-7} \text{ J}$

$$U_2 = -1.182 \times 10^{-6} \text{ J}$$

$$U_2 = \frac{k (3 \text{ n}) (-4 \text{ n})}{(0.12)} = -9 \times 10^{-7} \text{ J}$$

$$U_{\text{net}} = -1182 \text{ nJ}$$

d)



$$Q = 5 \text{ nC}$$

$$F_1 = \frac{k|Q||q_1|}{(0.12)^2}$$

$$F_1 = \frac{k(5\text{n})(3\text{n})}{(0.12)^2} = 9.375 \times 10^{-6} \text{ (}\hat{j}\text{)}$$

$$F_2 = \frac{k(5\text{n})(2\text{n})}{(0.12)^2} = 6.25 \times 10^{-6} \text{ (-}\hat{i}\text{)}$$

$$F_3 = \frac{k|Q||q_3|}{(\sqrt{(0.12)^2 + (0.12)^2})^2} (\cos 45^\circ \hat{i} - \sin 45^\circ \hat{j})$$

$$F_3 = 4.42 \times 10^{-6} \hat{i} - 3.125 \times 10^{-6} \hat{j}$$

$$F_R = -1.83 \times 10^{-6} \hat{i} + 6.25 \times 10^{-6} \hat{j}$$

$$\theta = 180^\circ - 74^\circ$$

$$\theta = 106$$

$$\theta = \tan^{-1} \left(\frac{6.25 \times 10^{-6}}{-1.83 \times 10^{-6}} \right) = -73.68^\circ$$

$$\theta = 106^\circ$$

$$m = 10 \text{ mg}$$

$$q = -4 \text{ }\mu\text{C}$$

$$V_0 = 20 \text{ m/s (}\hat{i}\text{)}$$

$$E = 50 \text{ N/C (}\hat{j}\text{)}$$

$$|z/\#z|$$

$$\vec{E} = \vec{E}$$

$$F = Eq$$

$$F = ma$$

$$F = F$$

$$Eq = ma$$

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

$$a = \frac{(50)(4\mu)}{1 \times 10^{-5}} = 20 \text{ m/s}^2$$

$$a = 20 \text{ m/s}^2$$

$$b) t = 1.50 \text{ s}$$

$$V = V_0 + at$$

$$V = 20 + (20)(1.5) = 50$$

$$V = 20 + 30 = 50 \text{ m/s}$$

$$V = 50 \text{ m/s}$$