

P #11

Ch 15 - pg 491

$$q_1 = 5.00 \text{ nC} = 5.00 \times 10^{-9} \text{ C}$$

$$q_2 = 6.00 \text{ nC} = 6.00 \times 10^{-9} \text{ C}$$

$$q_3 = -3.00 \text{ nC} = -3.00 \times 10^{-9} \text{ C}$$

$$r_{12} = .300 \text{ m}$$

$$r_{13} = .100 \text{ m}$$

$$+5 \text{ nC}$$

①

$$+6 \text{ nC}$$

②

$$-3 \text{ nC}$$

③

Calculate F_{1-2}

$$F_e = \frac{k_e \cdot |q_1| \cdot |q_2|}{r^2}$$

$$= \frac{(9.0 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2)(5.0 \times 10^{-9} \text{ C})(6.0 \times 10^{-9} \text{ C})}{(.300 \text{ m})^2}$$

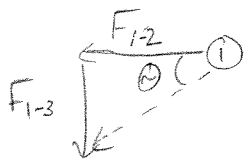
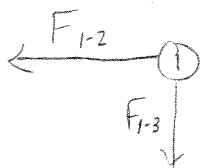
$$F_{1-2} = 3 \times 10^{-6} \text{ N (Repulsive)}$$

Calculate F_{1-3}

$$F_e = \frac{(9.0 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2)(5.0 \times 10^{-9} \text{ nC})(3.0 \times 10^{-9} \text{ nC})}{(.100 \text{ m})^2}$$

$$F_{1-3} = 1.35 \times 10^{-5} \text{ N (Attractive)}$$

Calculate resultant F_e on charge #1



$$F_e = \sqrt{F_{1-2}^2 + F_{1-3}^2}$$

$$= \sqrt{(3 \times 10^{-6} \text{ N})^2 + (1.35 \times 10^{-5} \text{ N})^2}$$

$$= 1.38 \times 10^{-5} \text{ N}$$

$$\tan \theta = \frac{F_{1-3}}{F_{1-2}} \quad \text{so} \quad \theta = \tan^{-1} \left(\frac{1.35 \times 10^{-5} \text{ N}}{3 \times 10^{-6} \text{ N}} \right)$$

$$\theta = 77.5^\circ$$

$$F_e = 1.38 \times 10^{-5} \text{ N}$$

77.5° below x-axis