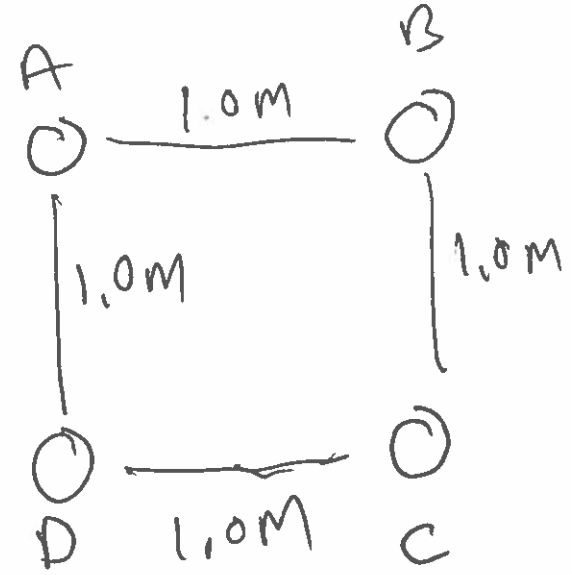


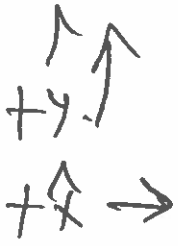
$Q_A = +3\mu C$

$Q_B = +4\mu C$

$Q_C = +5\mu C$

$Q_D = -1\mu C$

$\vec{F}_{NET-D} = ?$



$$\vec{F}_{NET\to D} = \vec{F}_{A\to D} + \vec{F}_{B\to D} + \vec{F}_{C\to D}$$

$$\vec{F}_{A\to D} = \frac{kQ_AQ_D}{(1.0M)^2}\,+\hat{y}$$

$$\vec{F}_{C\to D} = \frac{kQ_CQ_D}{(1.0M)^2}\,+\hat{x}$$

$$\vec{F}_{B\to D} = \frac{kQ_BQ_D}{(\sqrt{2}\,m)^2}\quad 45^\circ \text{ above } +\hat{x}$$

$$\vec{F}_{NET\,x\to D} = \frac{kQ_CQ_D}{1m^2} + \frac{kQ_BQ_D}{2m^2}\cos 45^\circ$$

$$\vec{F}_{NETY\to D} = \frac{kQ_AQ_D}{1m^2} + \frac{kQ_BQ_D}{2m^2}\sin 45^\circ$$

$$F_{net\to x} = kQ_D\left(\frac{Q_C}{1m^2} + \frac{Q_B\cos 45^\circ}{2m^2}\right)$$

$$= \left(8.99\times10^{9}\frac{Nm^2}{C^2}\right)\left(1\times10^{-6}C\right)\left[\frac{5\times10^{-6}C}{1m^2} + \frac{4\times10^{-6}C\cos 45}{2m^2}\right]$$

$$F_{net\to x} = 5.77\times10^{-2}N$$

$$F_{net\to y} = kQ_D\left(\frac{Q_A}{1m^2} + \frac{Q_B\sin 45^\circ}{2m^2}\right)$$

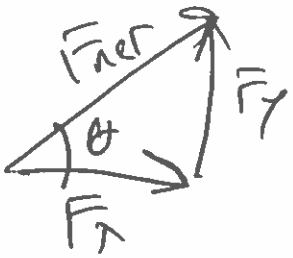
$$= \left(8.99\times10^{9}\frac{Nm^2}{C^2}\right)\left(1\times10^{-6}C\right)\left[\frac{3\times10^{-6}C}{1m^2} + \frac{4\times10^{-6}C\ \sin}{2m^2}\right]$$

$$F_{net\to y} = 3.97\times10^{-2}N$$

$$\vec{F}_{Net\to D} = (5.77\times10^{-2}N)\,\hat{+x} + 3.97\times10^{-2}\,\hat{+y}$$

$$|\vec{F}_{net}| = \sqrt{(5.77\times10^{-2}N)^2 + (3.97\times10^{-2}N)^2}$$

$$\boxed{|\vec{F}_{net}| = 7.00\times10^{-2}N}$$

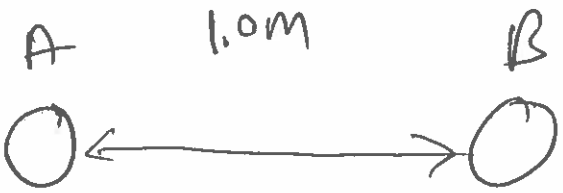


$$\theta = \tan^{-1}\left(\frac{F_{NetY}}{F_{NetX}}\right)$$

$$\theta = \tan^{-1}\left(\frac{3.97\times10^{-2}\,N}{5.77\times10^{-2}\,N}\right)$$

$$\theta = 34.5^{\circ}$$

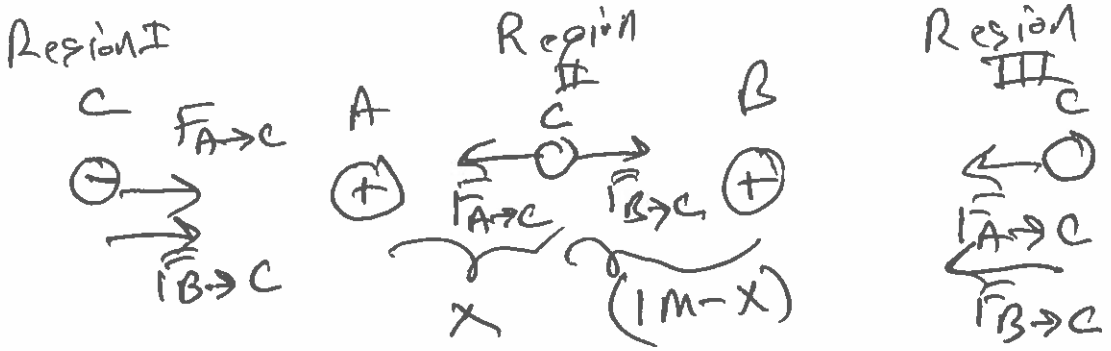
$$\vec{F}_{Net\rightarrow D} = 7.00\times10^{-2}\,N \text{ @ } 34.5^{\circ} \text{ above } +\hat{X}$$



$Q_A = +3\mu C$

$Q_B = +2\mu C$

Where do I Place $Q_C = -1\mu C$ So That $\vec{F}_{net \to C} = 0$?



$$F_{A\to C} = F_{B\to C}$$

$$\frac{\cancel{K} Q_A \cancel{Q_C}}{r_{AC}^2} = \frac{K Q_B \cancel{Q_C}}{r_{BC}^2}$$

$$\frac{Q_A}{r_{AC}^2} = \frac{Q_B}{r_{BC}^2}$$

$$\frac{Q_A}{X^2} = \frac{Q_B}{(1M-X)^2}$$

$$(1m - x)^2 = \left(\frac{QB}{QA}\right) x^2$$

$$1m^2 - 2mx + x^2 = \frac{QB}{QA} x^2 = \frac{2\mu C}{3\mu C} x^2 = \frac{2}{3} x^2$$

$$\left(1 - \frac{2}{3}\right) x^2 - 2mx + 1m^2 = 0$$

$$\frac{1}{3} x^2 - 2mx + 1m^2 = 0$$

$$\underset{a}{} x^2 - \underset{b}{6m} x + \underset{c}{3m^2} = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-6m) \pm \sqrt{(-6m)^2 - 4(1)(3m^2)}}{2(1)}$$

$$x = \frac{6.0m \pm \sqrt{36m^2 - 12m^2}}{2}$$

$$x = \frac{6 \pm \sqrt{24}}{2} \; m$$

$$x = 5.4m \;,\; 0.55m \;?$$

$$x = 0.55m \text{ or } \boxed{Q_C \text{ is } 0.55m \text{ to Right of } Q_A}$$

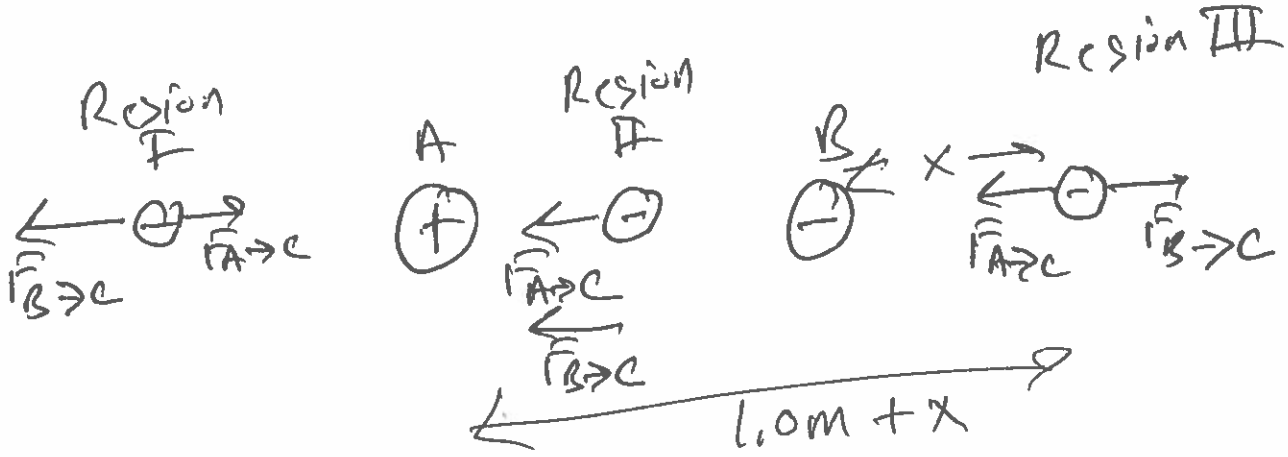
A ○ ← 1.0m → ○ B

$Q_A = +3\mu C$

$Q_B = -2\mu C$

$Q_C = -1\mu C$

Where can Q_C be placed to make $F_{net \to C} = 0$?



$$\vec{F}_{A\to C} = \vec{F}_{B\to C}$$

$$\frac{k\, Q_A Q_C}{r_{AC}^2} = \frac{k\, Q_B Q_C}{r_{BC}^2}$$

$$\frac{Q_A}{(1m+x)^2} = \frac{Q_B}{x^2}$$

$$\frac{QA}{QB}\, x^2 = (1m + x)^2 = 1m^2 + 2mx + x^2$$

$$\frac{3\mu C}{2\mu C}\, x^2 = \frac{3}{2} x^2 = 1m^2 + 2mx + x^2$$

$$\left(\frac{3}{2} - 1\right) x^2 - 2mx - 1m^2 = 0$$

$$\frac{1}{2} x^2 - 2mx - 1m^2 = 0$$

$$x^2 - 4m\,x - 2m^2 = 0$$

$$x = \frac{-(-4m) \pm \sqrt{(4m)^2 - 4(2m^2)(1)}}{2}$$

$$x = \frac{2 \pm \sqrt{6}}{2}\, m$$

$$x = -.45m, \quad 4.45m$$

$$x = \frac{4m \pm \sqrt{16m^2 + 8m^2}}{2}$$

$$X = \frac{4m \pm \sqrt{24m^2}}{2}$$

$$X = \frac{4m \pm 4.9}{2} = 2 \pm 2.45$$

$$X = -.45m \text{ or } 4.45m$$

$X = 4.45m$ To right of Q1