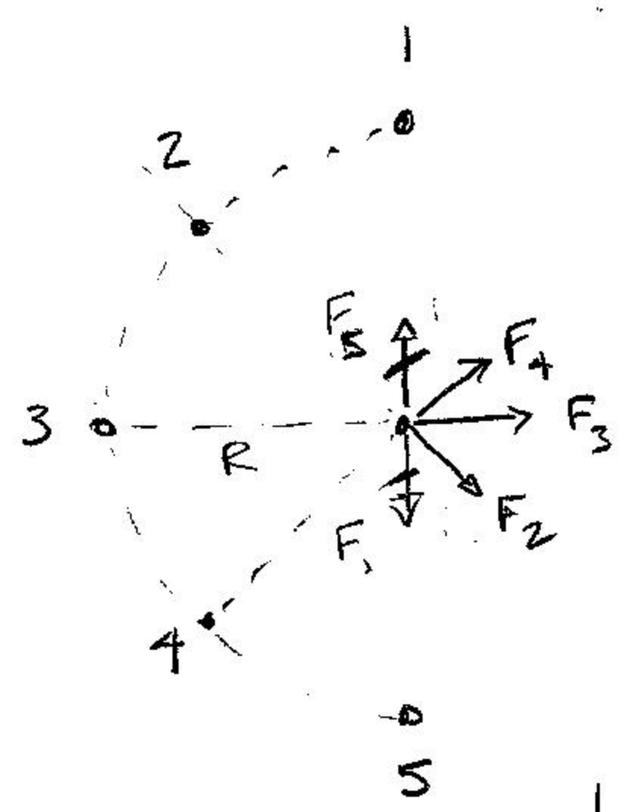
35. GIVEN: 5 CHARGES $= Q$ ON SEMICIRCLE, R

1 CHARGE $= q$ AT CENTER

FIND: F_q



$$\left|\vec{F}_3\right| = \left|\vec{F}_4\right| = \left|\vec{F}_5\right| = \frac{kQq}{R^2}$$

F_1 CANCELS F_5

F_{2y} CANCELS F_{4y}

$$\left|F_{2x}\right| = \left|F_{4x}\right| = \frac{kQq}{R^2}\cos 45$$

$\frac{\sqrt{2}}{2}$

$$\left|F_q\right| = F_{2x} + F_{4x} + \left|\vec{F}_3\right|$$

$$= 2\frac{kQq}{R^2}\frac{\sqrt{2}}{2} + \frac{kQq}{q} = \frac{(1+\sqrt{2})kQq}{R^2}$$

(+ x DIRECTION)

74. GIVEN: 2 CHARGES $= q$ ON THREADS, LENGTH $= L$

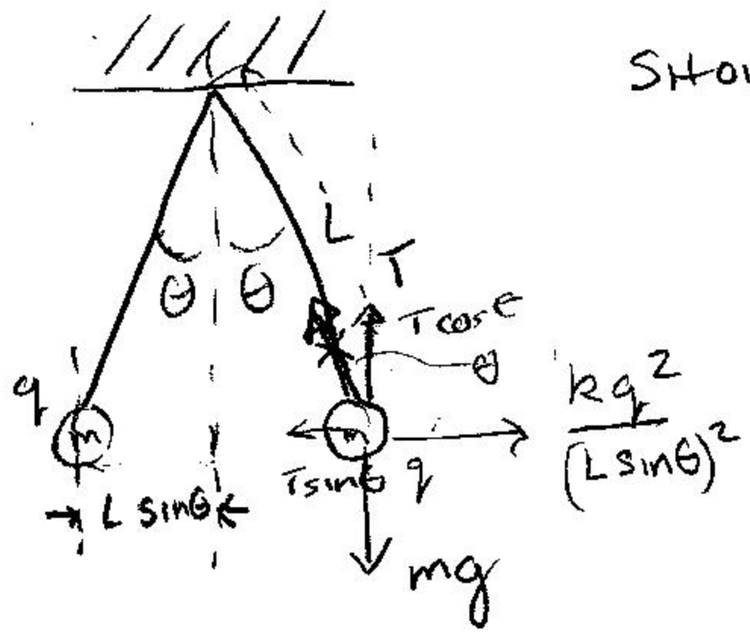
HANGING ANGLE $= \theta$, MASS $= m$

$m = 0.010\,kg$

$L = 0.50\,m$

$\theta = 10°$

SHOW: $q = 2L\sin\theta\sqrt{\frac{mg}{k}\tan\theta}$



$$T\cos\theta = mg$$

$$T\sin\theta = \frac{kq^2}{(2L\sin\theta)^2}$$

$$\frac{mg}{\cos\theta}\sin\theta = \frac{kq^2}{(2L\sin\theta)^2}$$

$$q^2 = \frac{mg\tan\theta\,(2L\sin\theta)^2}{k}$$

$$q = 2L\sin\theta\sqrt{\frac{mg}{k}\tan\theta}$$

$$q = 2(.5\,m)\sin 10°\sqrt{\frac{(0.010\,kg)(9.8\,m/s^2)}{9\times10^9\,\frac{N\cdot m^2}{C^2}}\tan 10°} = 2.41\times10^{-7}\,C = \boxed{0.241\,\mu C}$$