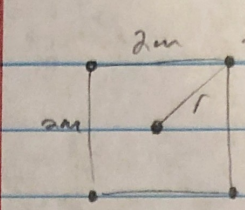
1)



$r = \sqrt{2} = 1.41\ m$

$V = 4\left(k_e \frac{q}{r}\right)$

$= 4\left(8.99\times10^9 \frac{N\cdot m^2}{C^2}\right)\left(\frac{6\times10^{-6}\ C}{1.41\ m}\right)$

$= 153{,}021\ V$

$= 153\ kV$

$\frac{N\cdot m^2}{C^2}\left(\frac{C}{m^2}\right)$

2) $q = 6.12\times10^{-6}\ C$

$r = 0.710\ m$

a) $E = k_e \frac{|q|}{r^2}$

$= (8.99\times10^9)\left(\frac{6.12\times10^{-6}\ C}{0.504\ m^2}\right)$

$E = 1.09\times10^5\ N/C$

$\Phi = EA_\perp$

$= Er^2$

$= (1.09\times10^5\ N/C)(0.504\ m^2)$

$\Phi = 55018\ \frac{N m^2}{C}$

b) $E = (8.99\times10^9)\left(\frac{6.12\times10^{-6}\ C}{0.01562\ m^2}\right)$

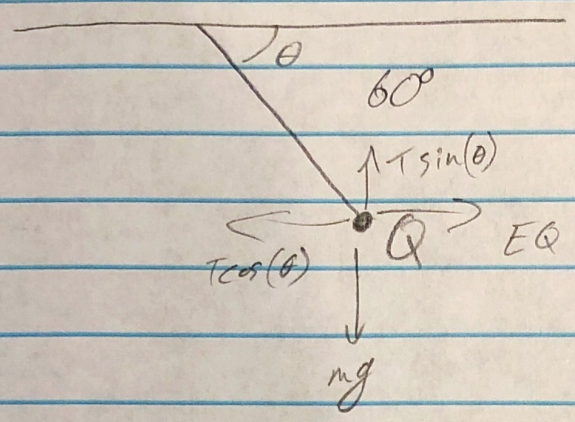
$E = 3.52\times10^6\ N/C$

$\Phi = EA_\perp$

$= (3.52\times10^6)(0.0156\ m^2)$

$\Phi = 55018\ \frac{N m^2}{C}$

3)



$E = 1750\ N/C$

$= (0.0085kg)(9.8)$

$mg = 0.0833\ N$

$F_x = \emptyset$

$EQ = T\cos(\theta)$

$Q = \frac{0.0962(\frac{1}{2})}{1750}$

$Q = 0.0000275\ C$

$Q = 2.75 \times 10^{-5}\ C$

$F_y = \emptyset$

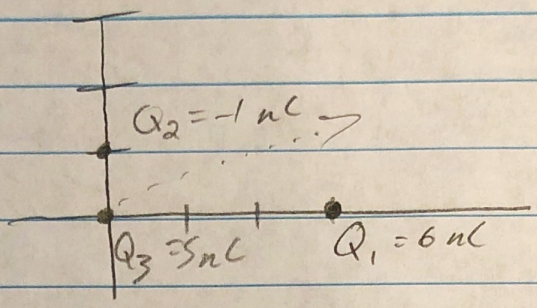
$T\sin(60) = mg$

$T = \frac{mg}{\sin(60)}$

$T = \frac{0.0833}{0.866}$

$T = 0.0962\ N$

4) a)



a) $F_{1\to 3} = k_e \frac{30\times10^{-9}C^2}{0.02m^2}$

$F_{1\to 3} = 2,996\ N\hat{i}$

$F_{2\to 3} = k_e \frac{5\times10^{-9}C^2}{0.01m^2}$

$F_{2\to 3} = 4,495\ N\hat{j}$

$|F| = 5401\ N$

b) $\tan(\theta) = \frac{F_{2\to 3}}{F_{1\to 3}}$

$\theta = \tan^{-1}\left(\frac{4495}{2996}\right)$

$\theta = 56.3°$

5) $q = 1.0\times10^{-6}\ \mu C$

$q = 1.0\times10^{-6}\times10^{-6}\ C$

$\Phi = \frac{q}{\varepsilon_0} = 0.11\ \frac{Nm^2}{C^2}$

6) $\frac{k_e |q||Q|}{0.01\,m^2} - \frac{k_e |q||q|}{0.04\,m^2} = \emptyset$

$5124300q - (2.25 \times 10^{11} q^2) = \emptyset$

$q = 2.3 \times 10^{-5} C$