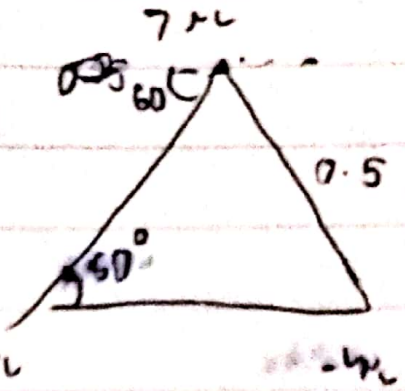
(Q3)

$$F = k\frac{q_1 q_2}{r^2}$$

$$9\times10^{9} \times \frac{1.6\times10^{-19}}{2\times10^{-15}} = 57.5\,N$$

(Q4)



$$F_{2-7} = \frac{kq_1q_2}{r^2}$$

$$\frac{9\times10^{9}\times2\times10^{-6}\times7\times10^{-6}}{(0.5)^2} = 0.5$$

$$0.5(\cos60\,i + \sin60\,j) = 0.252\,i + 0.436\,j\ N$$

$$F_{7-4} = \frac{9\times4\times10^{-6}\times7\times10^{-6}}{(0.5)^2} =$$

$$+\,101(\cos60\,i - \sin60\,j) = 0.504\,i - 0.873\,j\ N$$

$$F_{NET} = -0.756\,i - 0.473\,j\ N$$

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(a) $f = k\frac{qq}{r^2}$

$$9\times10^{9} \times \frac{1.6\times10^{-19}}{0.529\times10^{-10}} = \boxed{8.22\times10^{-8}\,N}$$

(b) $f = \frac{mv^2}{r}$ $\quad v = \sqrt{\frac{fr}{m}}$

$$v = \sqrt{\frac{8.22\times10^{-6}\times0.529\times10^{-10}}{9.11\times10^{-31}}} = \boxed{2.19\times10^{6}\,m/s}$$

(Q7) $E_x = \frac{1}{4\pi\varepsilon_0}$ [illegible]

$$E_x = \frac{1}{4\pi\varepsilon_0} \times \frac{\sqrt{2}}{(0.05\times10^{-2})^2}\left(\frac{10\times10^{-9}}{2} + 20\times10^{-9} - 20\times10^{-9} - \frac{10\times10^{-9}}{2}\right)$$

$$\boxed{0}$$

$$E_y = \frac{1}{4\pi\varepsilon_0} \times \frac{\sqrt{2}}{(0.05\times10^{-2})^2}\left(-10\times10^{-9} + 20\times10^{-9} + 20\times10^{-9} - 40\times10^{-9}\right)$$

$$\boxed{1.02\times10^{5}\,j\ N/C}$$

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(Q6) $E = 9\times10^{9} \times \frac{12}{(5\times10^{-6})^2} - \frac{3}{(5\times10^{-6})^2}$

(c)

H.W

(a) $x = 1m \quad x = -1 \quad y = 0.5m$

(c) $E = \frac{kq}{x^2+y^2} \tan^{-1}\left[\frac{-1.00}{0.500}\right] = 63.4$

$E = \frac{9\times10^{9} \times -3\times10^{-6}}{1^2 + 0.5^2} \times \cos(63.4) \times 2$

$E = 1.9\times10^{4}\ N/C$

(b) $F = QE \qquad |4\times10^{4} \times -3\times10^{-6}| = 0.05\ N$

(d) $F = \frac{keq}{(x-a)^2} - \frac{keq}{(x-(-a))^2} = \frac{ke'q(4ax)}{(x^2-a^2)^2}$

when x greater than a:

$\frac{4a\times keq}{x^4} = \frac{4akeq}{x^3} \simeq E$

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