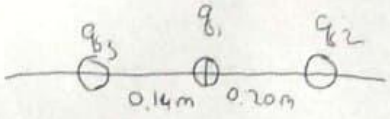
Homework 1

1) $F_x = -k\frac{q_1 q_3}{x^2} + k\frac{q_1 q_2}{0.2^2}$

$$-7.00 = 9\times10^9\left(-\frac{3\times8}{x^2}+\frac{3\times5}{0.2^2}\right)\times10^{-12}$$

$x = 0.14\,m$



2) a) $$E = \frac{k|q|}{r^2} = \frac{9\,10^9\,\frac{Nm^2}{C^2}\cdot|-3\cdot10^{-9}C|}{(0.25m)^2} = 432\,\frac{N}{C}$$

b) $$r = \sqrt{\frac{k|q|}{E}} = \sqrt{\frac{9\cdot10^9\,\frac{Nm^2}{C^2}\cdot|-3\cdot10^{-9}C|}{12\,\frac{N}{C}}} = 1.5m$$

3) a) $\vec{r} = -\hat{j}$ b) $\vec{r} = \frac{1}{\sqrt{2}}\hat{i} + \frac{1}{\sqrt{2}}\hat{j}$

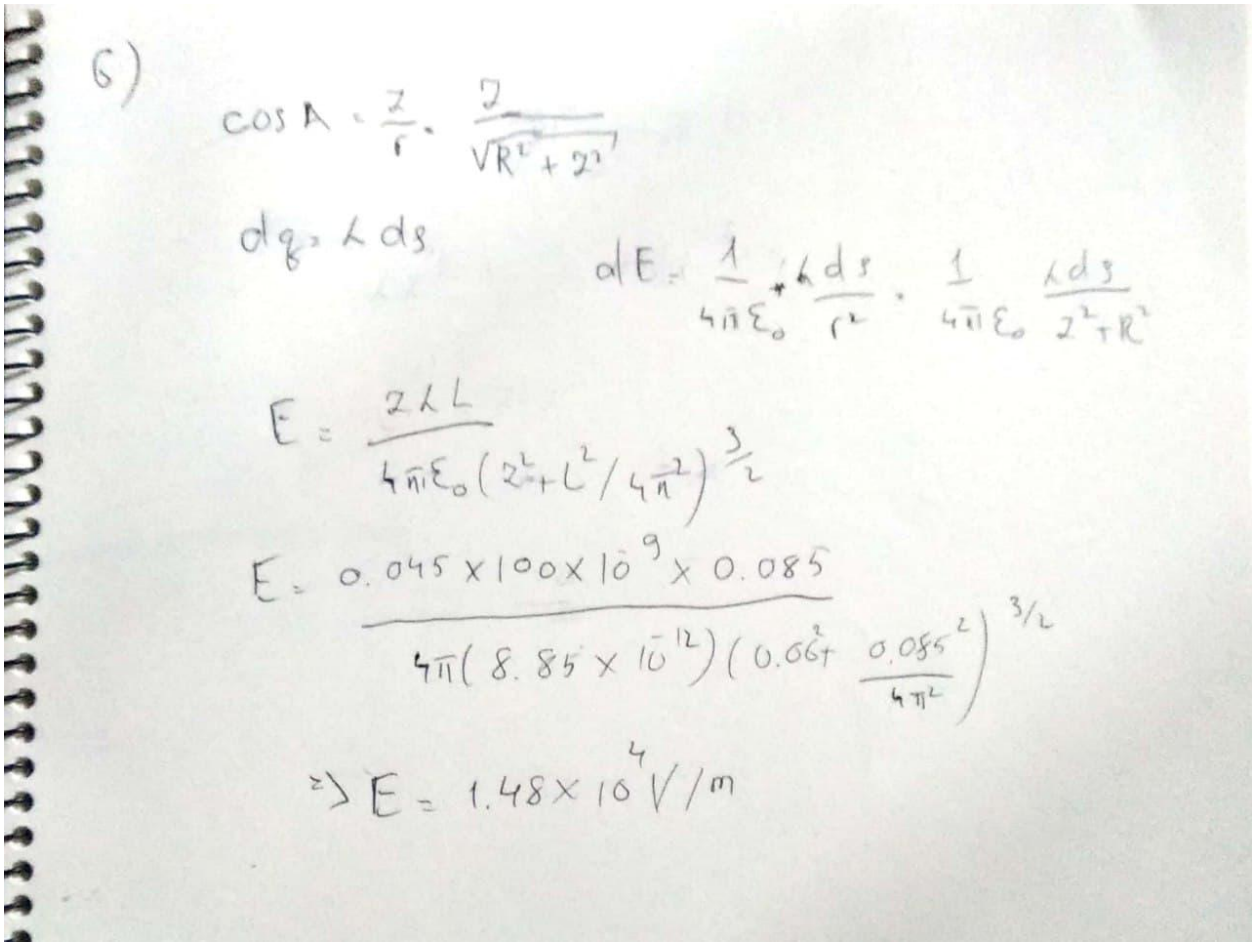
c) $\vec{r} = -0.3871\hat{i} + 0.9150\hat{j}$

5) $$F = k\left(\frac{q_1}{r_1}-\frac{q_2}{r_2}\right) = \left(9\times10^9\,Nm^2C^{-2}\right)\left(\frac{(-0.25nC)\left(\frac{10^{-9}C}{1nC}\right)}{(0.15m)^2}\right)$$

$$\left(\frac{(-12nC)\left(\frac{10^{-9}C}{1nC}\right)}{(0.10m)^2}\right) = 8750\,N/C \text{ at A}$$

$$6543.36\,N/C \text{ at B}$$

The electric force on a proton at A is $1.4\times10^{-15}\,N$



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