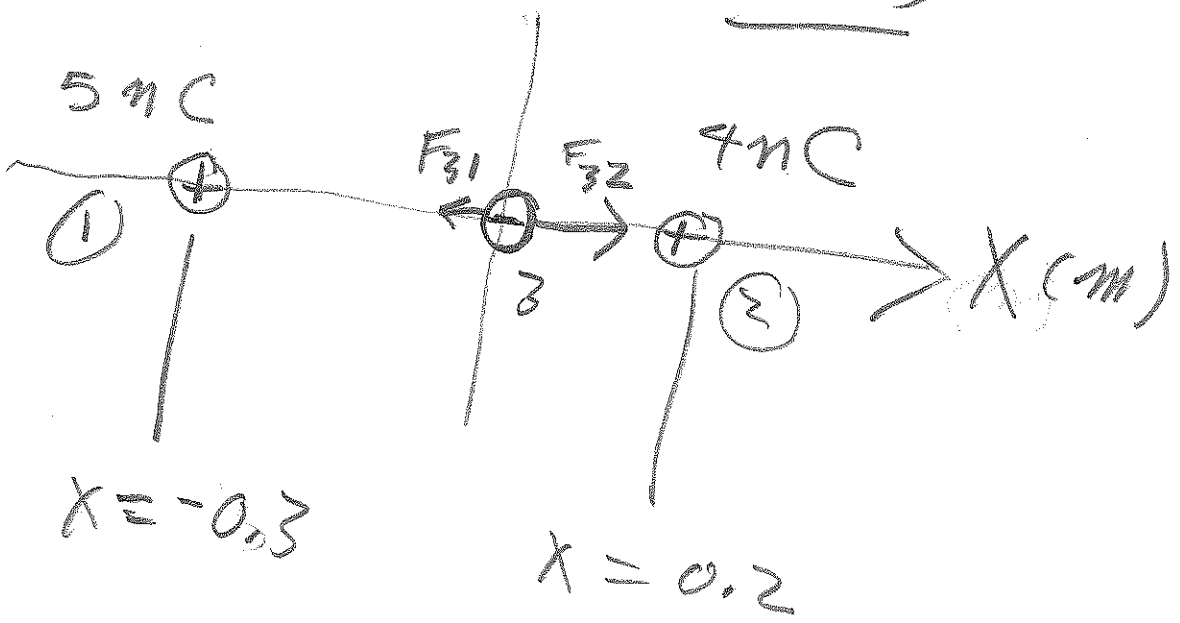
Quiz 1 Student questions Ch 21

22. Qualitative views



$$F_{31} = \frac{k(6nc)(5nc)}{(0.3m)^2}$$

$$F_{32} = \frac{k(6nc)\cdot(4nc)}{(0.2m)^2}$$

$$\frac{F_{31}}{F_{32}} = \frac{(0.2)^2}{(0.3)^2}\cdot\frac{5}{4} = \frac{4}{9}\cdot\frac{5}{4} = \frac{5}{9}$$

$\vec{F}_{net} = F_{32} - F_{31}$, Right

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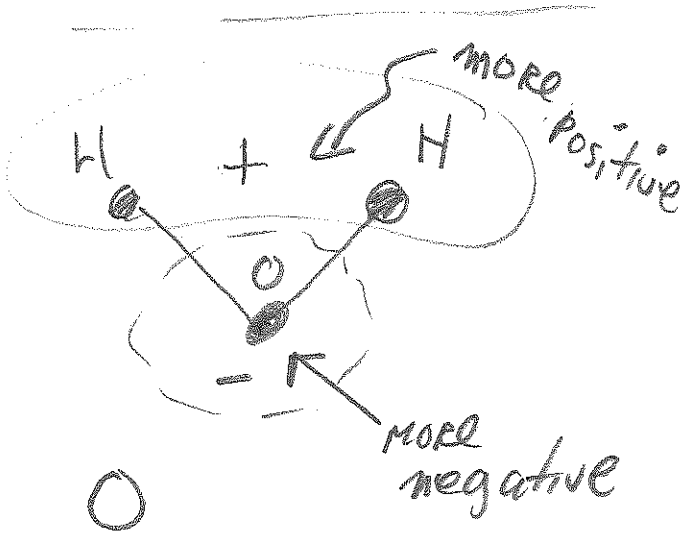
Dipoles theme

(58), (60.)

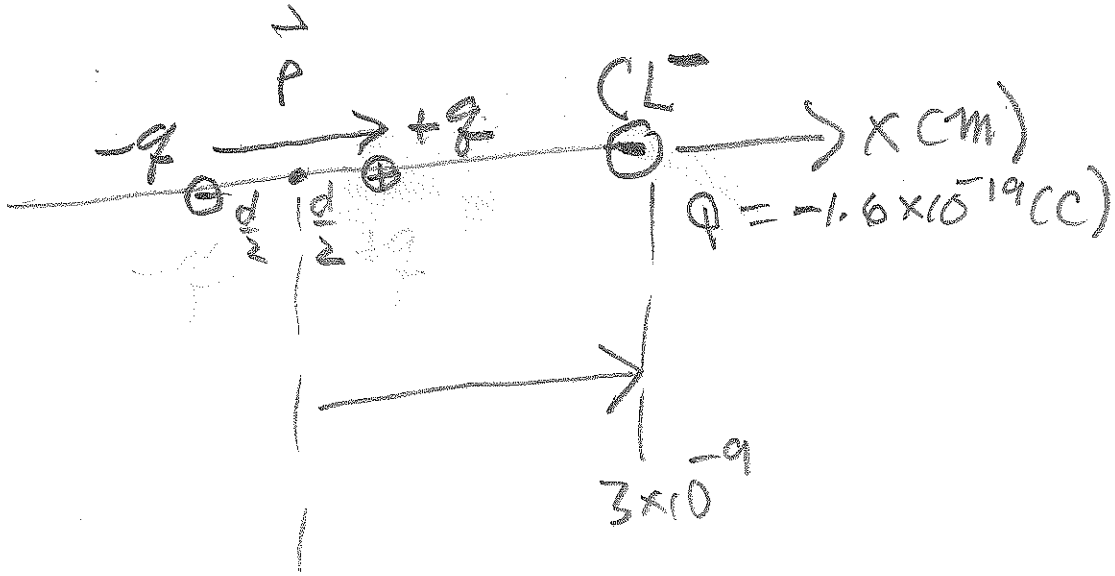
(58.) classic!



H_2O

$|\vec{p}| = p = 6.17 \times 10^{-30}\ C \cdot m$

O

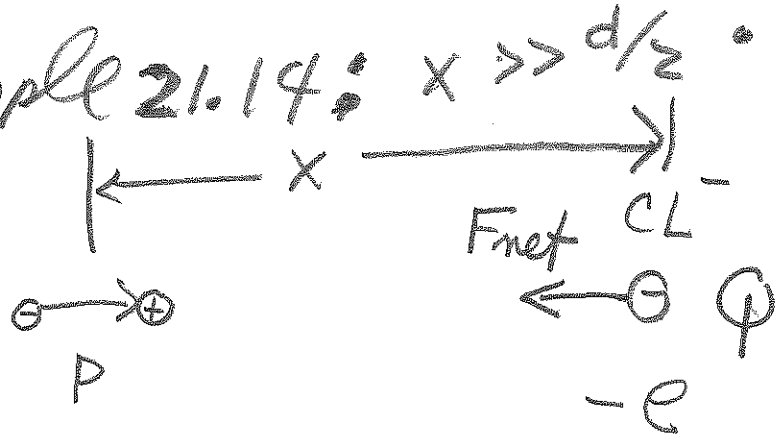


$q \neq 2e$: complicated calculation shows $q = f \cdot e$, $f < 1$.

#58

Simplify: EASY WAY

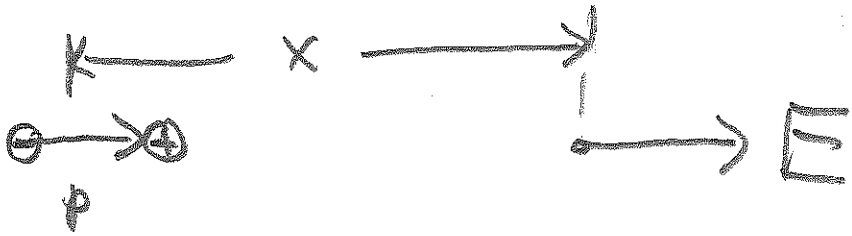
Use example 21.14: $x >> d/2$



$$F_{net} = \frac{|Q| \cdot P}{2\pi\varepsilon_0 x^3}, \quad x = 3 \times 10^{-9}\ (m)$$

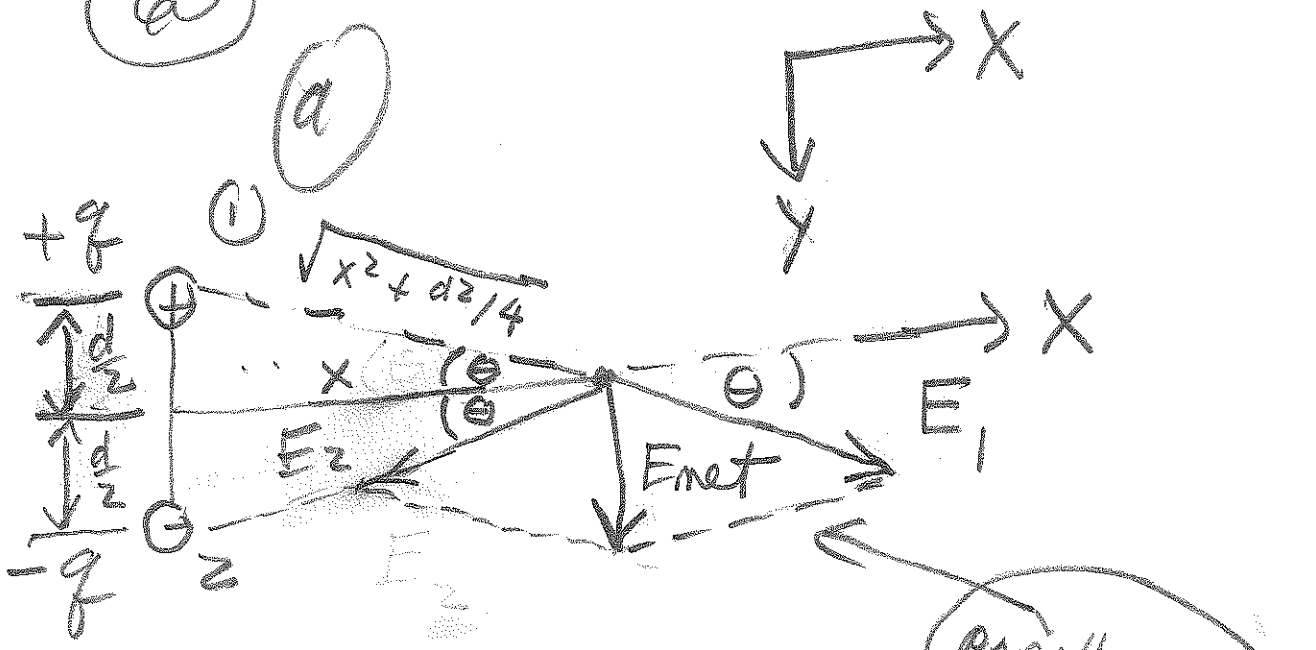
note: $F_{net} = |Q| \cdot E$

$$E = \frac{P}{2\pi\varepsilon x^3}$$



(60)

(a)



$$E_{net} = 2E \cdot \sin\theta = E_{net\,y}$$

$$E_1 = E_2 = E = \frac{kq}{\left(x^2 + \frac{d^2}{4}\right)}$$

$$\sin\theta = \frac{\left(\frac{d}{2}\right)}{\sqrt{x^2 + d^2/4}}$$

<u>NOTE</u>: $E_{1x} + E_{2x} = 0$

$$\Rightarrow E_{net} = \frac{kqd}{\left(x^2 + \frac{d^2}{4}\right)^{3/2}} = \frac{k \cdot p}{\left(x^2 + \frac{d^2}{4}\right)^{3/2}}$$

(c)

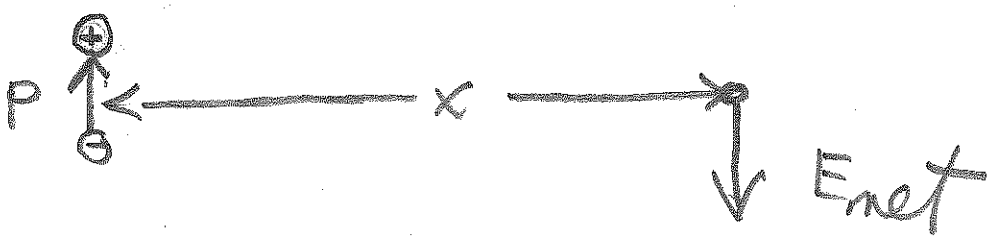
(b) let $x \to \infty$

i.e. $d << x < \infty$

$$\Rightarrow E_{net} \to \frac{kp}{(x^2)^{3/2}}$$

$$E_{net} \approx \frac{kp}{x^3}$$

$$E_{net} = \frac{p}{4\pi\varepsilon_0 x^3}$$

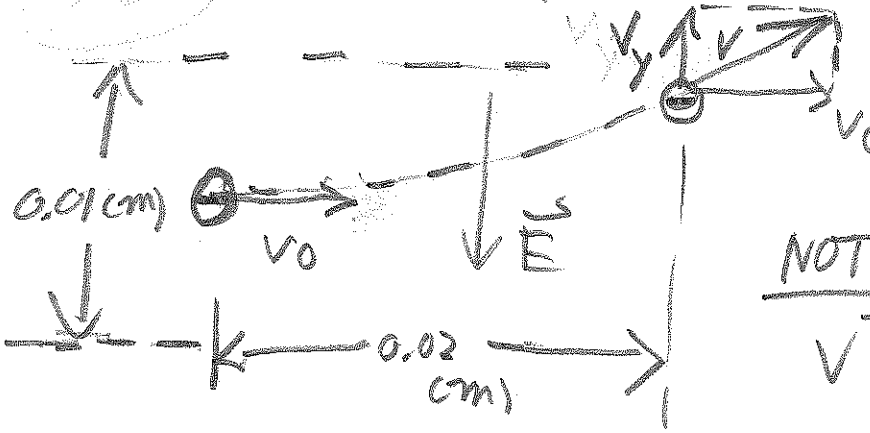


other quiz 1 student questions:

(33.), (75.)

↑ not assigned BUT useful

(33.) @ $\Delta y = v_{oy} \cdot t + \frac{1}{2}\left(\frac{eE}{m}\right)t^2 = \frac{1}{2}\left(\frac{eE}{m}\right)\cdot t^2$



NOTE: (#35) $v^2 = v_0^2 + v_y^2$

GENERAL NOTES: FOR the ABOVE PICTURE, Δy

$v_0 \cdot t = \Delta x = 0.02$ (cm)

$v_y = \frac{eE}{m} \cdot t$

OR $v_y^2 = 2 \cdot a \cdot \Delta y$

$= 2\left(\frac{eE}{m}\right) \cdot \Delta y$ ← 0.05 (cm)

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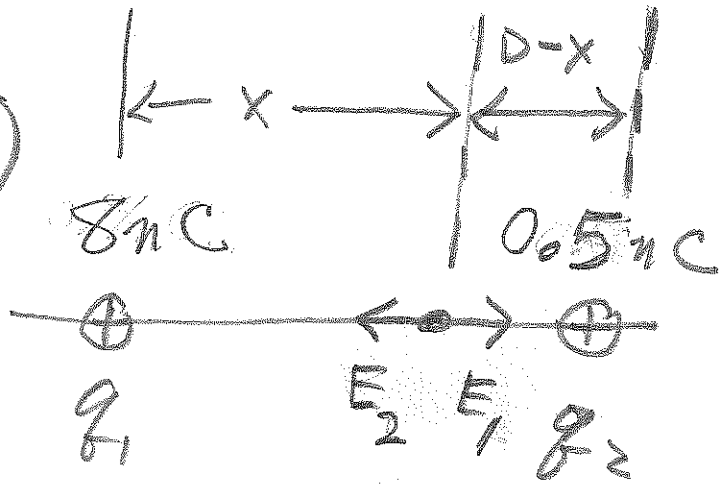
75.

CORRECTION POSTED DURING BREAK



$D = 1.20\ (m)$

$$E_2 = E_1$$

$$\frac{K \cdot q_2}{(D-x)^2} = \frac{K \cdot q_1}{x^2}$$

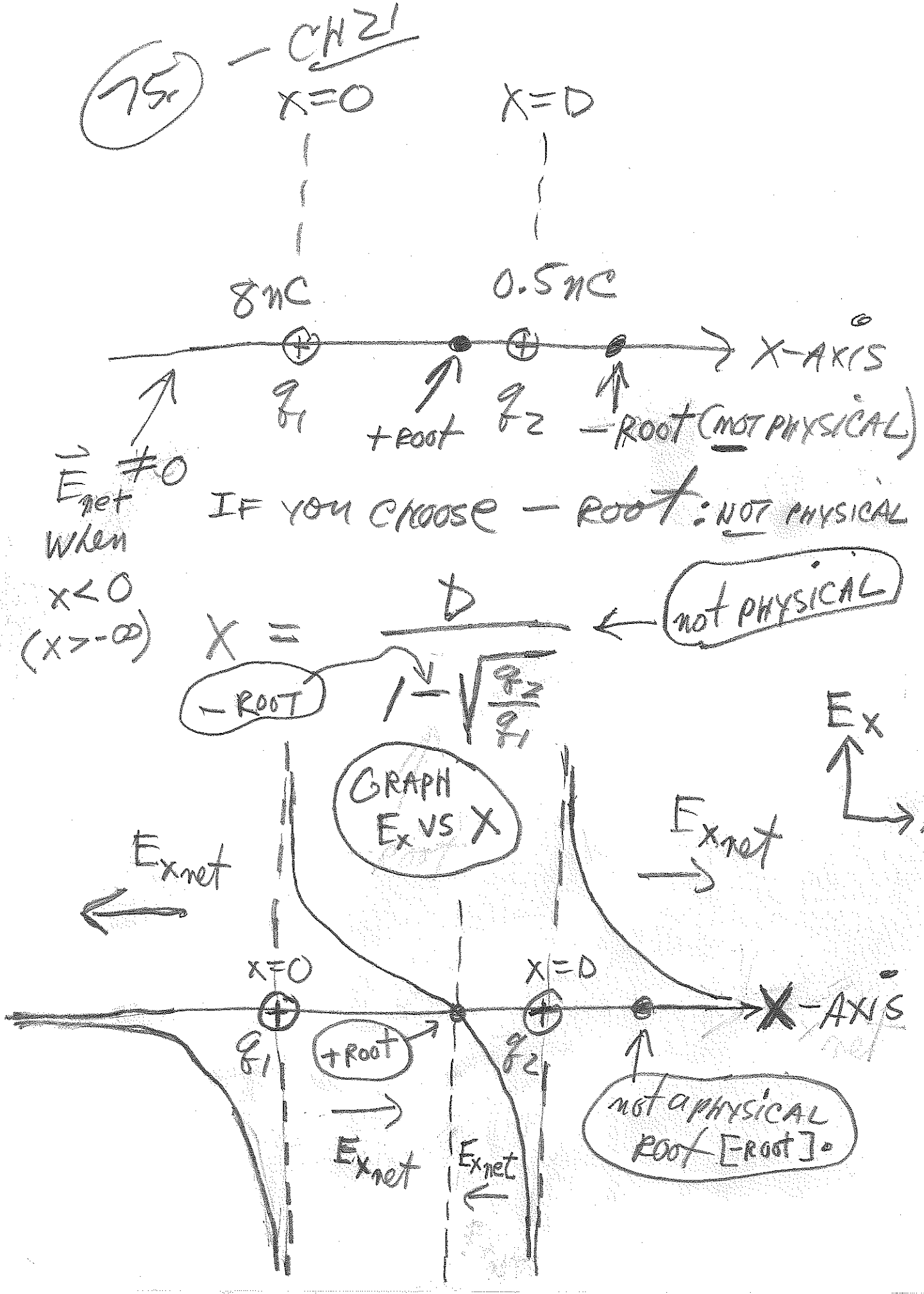
$$\Rightarrow \frac{q_2}{q_1} = \frac{(D-x)^2}{x^2}$$

$$\pm\sqrt{\frac{q_2}{q_1}} = \frac{(D-x)}{x}$$

$$\Rightarrow D - x = \pm\sqrt{\frac{q_2}{q_1}} \cdot x \Rightarrow x = \frac{D}{1 \pm \sqrt{\frac{q_2}{q_1}}}$$

ASSUME $x < D$

(75) — CH 21


x=0
x=D
8 nC
0.5 nC
X-AXIS
q_1
q_2
+ROOT
−ROOT (NOT PHYSICAL)
$\vec{E}_{net} \neq 0$
when
x<0
(x>−∞)
IF YOU CHOOSE − ROOT: NOT PHYSICAL
$x = \frac{D}{1 - \sqrt{\frac{q_2}{q_1}}}$
−ROOT
not PHYSICAL
GRAPH E_x vs X
E_x
x
$E_{x\,net}$
$E_{x\,net}$
x=0
x=D
X-AXIS
q_1
q_2
+ROOT
$E_{x\,net}$
$E_{x\,net}$
not a PHYSICAL ROOT [−ROOT].