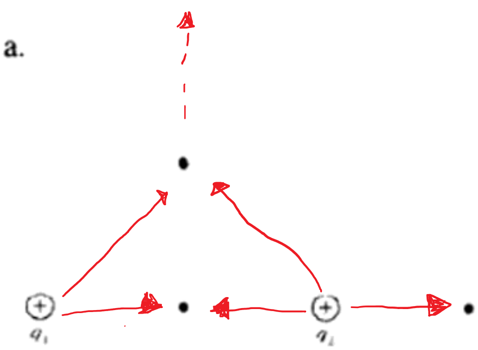
Recitation Worksheet 2

Tuesday, September 15, 2020 2:35 PM

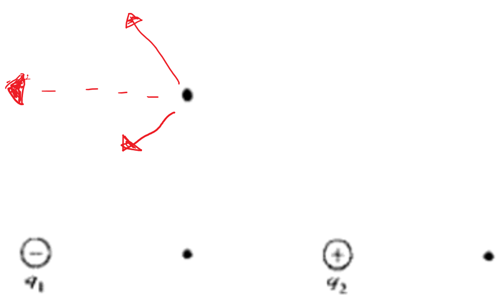
Alex Gaskins

Problem 1: At each of the dots, consider the direction of the net electric field $\overrightarrow{E_{net}}$. Be prepared to draw the electric fields

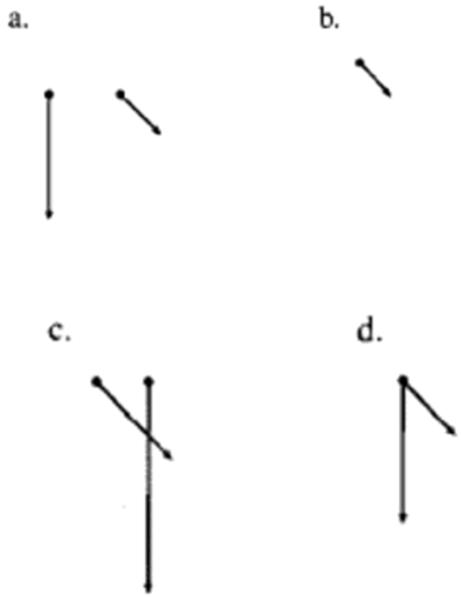
a.



b.



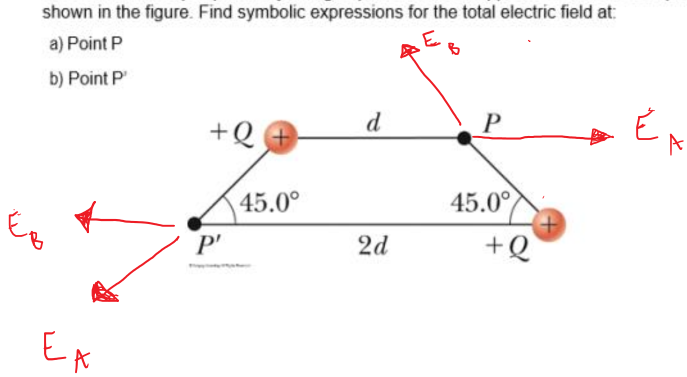
Problem 2: Each figure shows two vectors, these vectors represent the magnitudes of the electric field at these points. Can a point charge create and electric field that looks like this at these two points? If so, draw the charge on the figure. If not, why?



Problem 3: Two equal positively charged particles are at opposite corners of a trapezoid as shown in the figure. Find symbolic expressions for the total electric field at:

a) Point P

b) Point P'



$$E_x = -E_B \cos(45) + E_A$$
$$= \frac{kQ}{(\frac{d}{2})^2} \cdot \frac{1}{\sqrt{2}} + \frac{kQ}{d^2}$$
$$= \frac{kQ}{d^2}\left(\frac{4}{\sqrt{2}} + 1\right)$$
$$E_y = E_B \sin(45)$$
$$= \frac{kQ}{d^2}(\sqrt{2})$$

P

$$E_x = -E_A \cos(45) - E_B$$
$$= \frac{kQ}{(\frac{d}{2})^2} \cdot \frac{1}{\sqrt{2}} - \frac{kQ}{d^2}$$
$$= \frac{kQ}{d^2}\left(-\frac{4}{\sqrt{2}} - 1\right)$$
$$E_y = -E_A \sin(45)$$
$$= \frac{kQ}{d^2}(-\sqrt{2})$$

P'

$$E_p = \frac{kQ}{d^2}\left(1 - \frac{4}{\sqrt{2}}\right)\hat{i} + (\sqrt{2})\hat{j}$$

$$E_{p'} = \frac{kQ}{d^2}\left(-\frac{4}{\sqrt{2}} - 1\right)\hat{i} + (\sqrt{2})\hat{j}$$

Problem 4: A proton moves at **4.50 × 10^5 m/s** in the horizontal direction. It enters a uniform vertical electric field with a magnitude of **9.60 × 10^3 *N/C***. Ignoring gravitational effects, find:

a. the time interval required for the proton to travel **5.00 cm** horizontally

b. its vertical displacement during the time interval in which it travels **5.00 cm** horizontally

c. the horizontal and vertical components of its velocity after it has traveled **5.00 cm** horizontally

A.) $t = \frac{x}{v} = \frac{.05}{4.5\times10^{5}} = .00000011$ s

B.) $a = \frac{qE}{m} = \frac{1.6\times10^{-19}(9.6\times10^{3})}{1.67\times10^{-27}} = 9.21\times10^{11}$ m/s^2

$\Delta y = v_i t - \frac{1}{2}at^2$

$y = .57$ cm.

C.) $v_f = v_i + at$

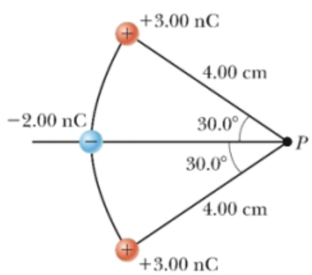
$= 1.02\times10^{5}$ m/s

$4.5\times10^{5}\,\hat{i} + 1.02\times10^{5}\,\hat{j}$

Problem 5: Three point charges are located on a circular arc as shown in the figure.

a) What is the total electric field at P, the center of the arc?

b) Find the electric force on a **-5.00 nC** point charged placed at P.



$E = \frac{kq}{r^2}$

Problem 6: For each of the figures, mark any point or points (other than infinity) where $\vec{E} = 0$. Each mark corresponds to one arbitrary distance unit.

a. 

b.