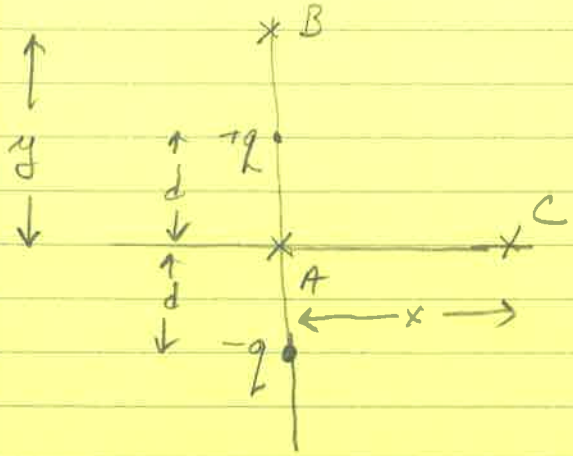
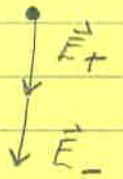
PHYS 212E
In-class exercise 1/16/18



Assume $q > 0$

At A:



Magnitudes: $E_+ = \frac{kq}{d^2}$

$E_- = \frac{kq}{d^2}$

$$\vec{E}_{net} = \vec{E}_+ + \vec{E}_-$$

$$= \frac{kq}{d^2}(-\hat{j}) + \frac{kq}{d^2}(-\hat{j})$$

$$= -\frac{2kq}{d^2}\hat{j}$$

At B:

Magnitudes: $E_+ = \frac{kq}{(y-d)^2}$

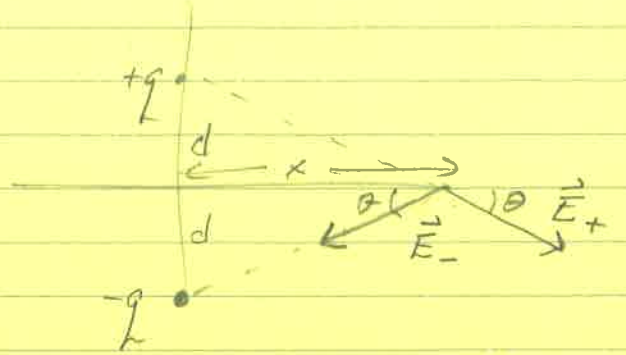
$E_- = \frac{kq}{(y+d)^2}$

$$\vec{E}_{net} = \vec{E}_+ + \vec{E}_-$$

$$= \frac{kq}{(y-d)^2}(+\hat{j}) + \frac{kq}{(y+d)^2}(-\hat{j})$$

$$= kq\left[\frac{1}{(y-d)^2} - \frac{1}{(y+d)^2}\right]\hat{j}$$

At C:



Magnitudes

$$E_+ = \frac{kq}{x^2+d^2}$$

$$E_- = \frac{kq}{x^2+d^2}$$

$$\vec{E}_{net} = \vec{E}_+ + \vec{E}_-$$

$$E_{net_x} = E_{+x} + E_{-x}$$

$$= 0$$

by symmetry

$$E_{net_y} = E_{+y} + E_{-y}$$

$$= -\frac{kq}{x^2+d^2}\sin\theta - \frac{kq}{x^2+d^2}\sin\theta$$

$$= \frac{-2kq}{x^2+d^2}\sin\theta$$

$$= \frac{-2kq}{x^2+d^2}\frac{d}{\sqrt{x^2+d^2}}$$

$$= \frac{-2kqd}{(x^2+d^2)^{3/2}}$$

$$\vec{E} = -\frac{2kqd}{(x^2+d^2)^{3/2}}\hat{j}$$