# PY 202 (Day 2)

1st quiz:
- 1 misdrew field lines
- 1 misused Coulomb's law ~~(drastically— Maybe it, somehow, a shared force!) it's a pair of forces~~

ex] Electron charge of copper penny (M = 3.1 g)

$$Q = (\#\ \text{electrons})(q_e)$$

$Z_{Cu} = 29 \Rightarrow \frac{29\ e^-}{1\ \text{atom}}$ $\quad q_e = 1.6\ E{-}19\ C$

$$Q = Z_{Cu}\left(\frac{N_A}{M_{Cu}}\right) M_{penny}\,(-q_e)$$

$M_{penny}$: 3.1 g

$M_{Cu} \rightarrow 63.5$ ~~moles/atoms/g~~ g/Mol

$$Q = -1.3 \times 10^5\ C$$

$$Q_{proton} = 1.3 \times 10^5\ C$$

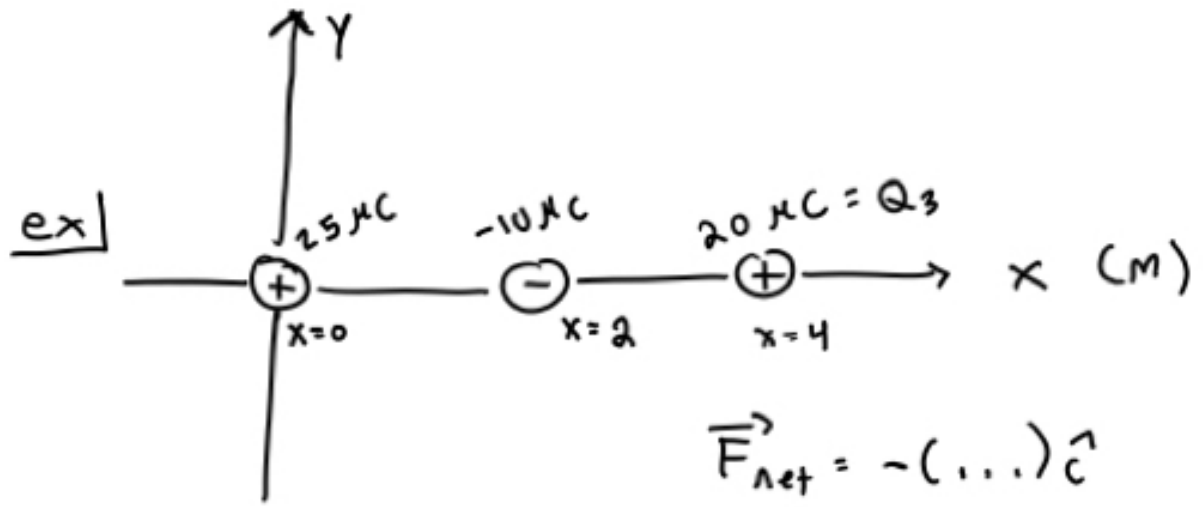
$$Q_{penny} = Q_e + Q_p = 0$$

What if $Q_{penny} = 1.6\ E\ 4$?

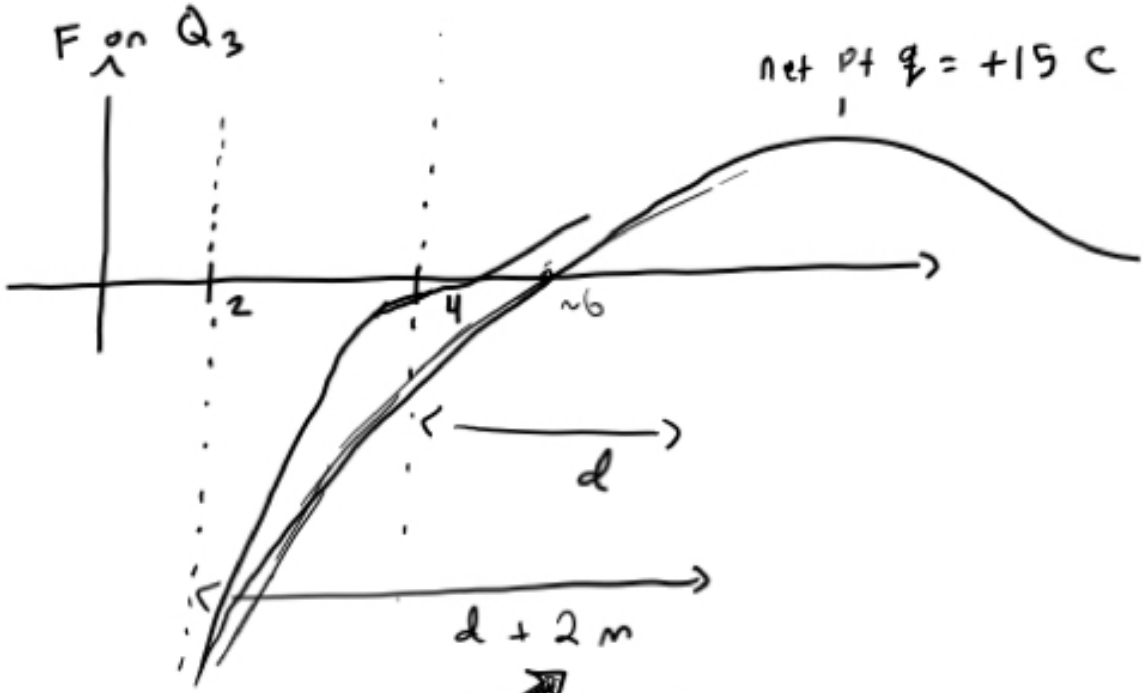
$Q_e$ less than what we had before (we removed electrons) →

$Q_{pf} = Q_{p_0}$ $\quad Q_{ef} = Q_{e_0} + 1.6\ E\ 4$

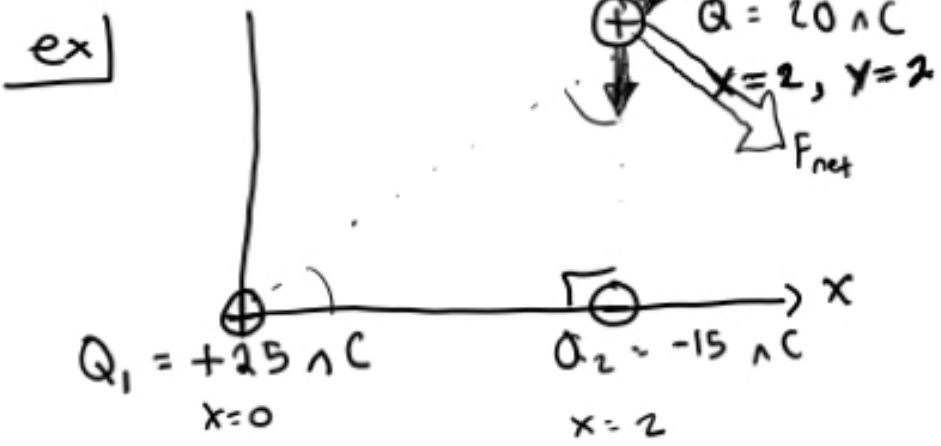
ex




$\vec{F}_{net} = -(\ldots)\hat{i}$




ex




$\vec{F}_{13} = F_{13}\cos(45°)\,\hat{i} + F_{13}\sin(45°)\,\hat{j}$

$\vec{F}_{23} = 0\hat{i} - F_{23,y}\,\hat{j}$

$\vec{F}_{net} = \vec{F}_{13} + \vec{F}_{23}$

$F_{net} = |\vec{F}_{net}| = \sqrt{F_{net,x}^2 + F_{net,y}^2}$

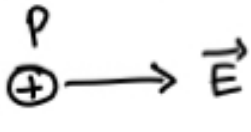
- txtbk: study examples!

## Electric Field

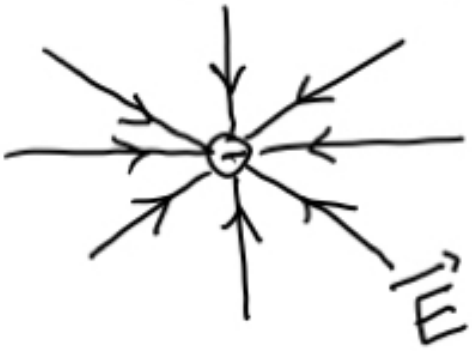

$\vec{E} = \frac{\vec{F}}{q}$ $q$ : small charge


$\vec{E}$ describes field at point... once we put something there, it tells us $\vec{F}$.

Positive test charge, find $\vec{F}$ on test charge: same direction as $\vec{E}$

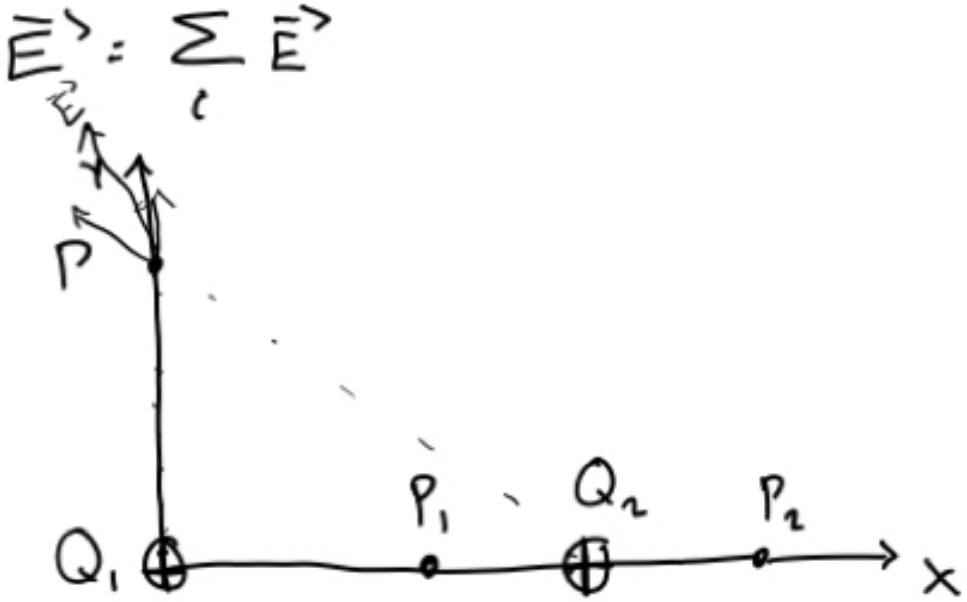



in order to measure $\vec{E}$, test $q$ must be (+). Otherwise $\vec{E}$ and $\vec{F}$ don't point same way.



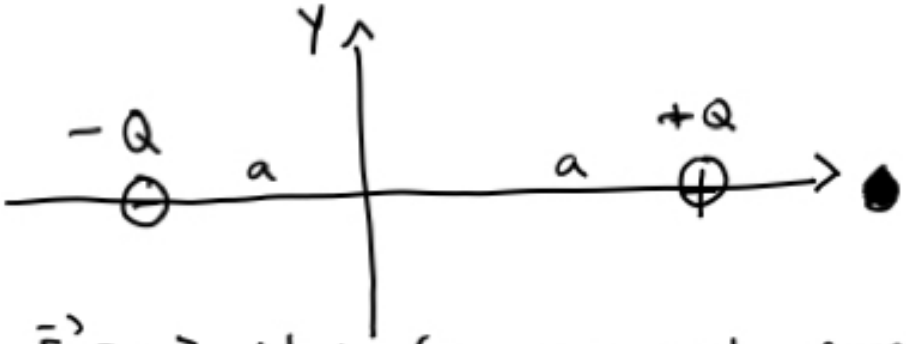

$|\vec{E}|$ only depends on $q_E$ causing the field.

$\vec{E} = \sum_i \vec{E}$

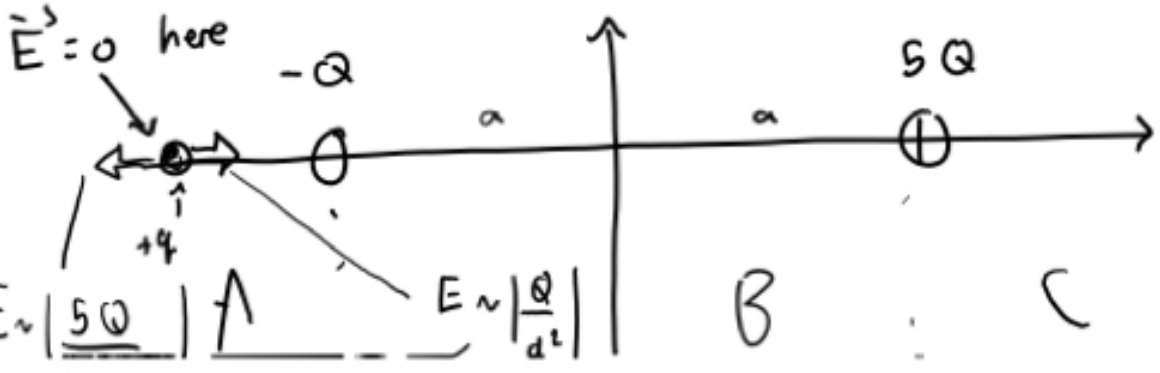



to find field at $P_1$, $P_2$, would have to put small positive test q's

$$\vec{E}_P = \vec{E}_{Q_1} + \vec{E}_{Q_2}$$




is $\vec{E} = 0$? Not for any point except infinity




$$\vec{E} = +\left(1000 \tfrac{N}{C}\right)\hat{i}$$

$$\vec{E} = \frac{\vec{F}}{q} \Rightarrow \vec{F} = q\vec{E}$$

$$\vec{F} = m\vec{a}$$

Proton: $q_p = +1.6\,E\text{-}19\ C$

$m_p = 1.67E\text{-}27\ kg$