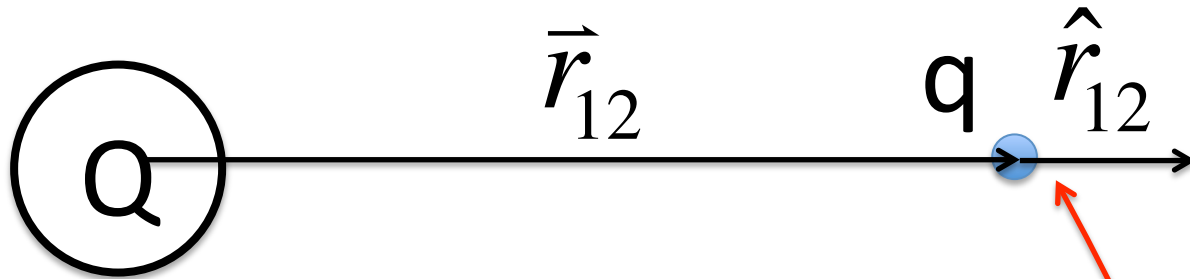


Electric Field



Force on q by Q

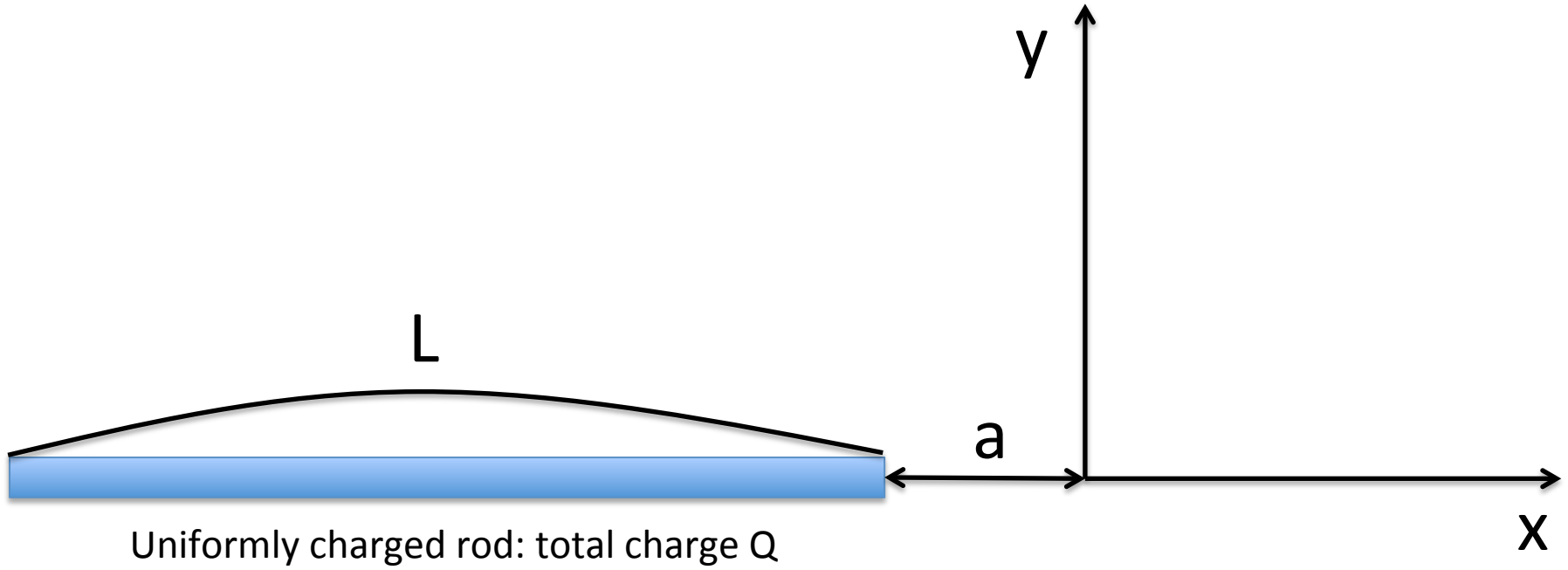
$$\vec{F}_{Qq} = \frac{1}{4\pi\epsilon_0} \frac{Qq}{|\vec{r}_{12}|^2} \hat{r}_{12}$$

Definition of Electric field: at this point is

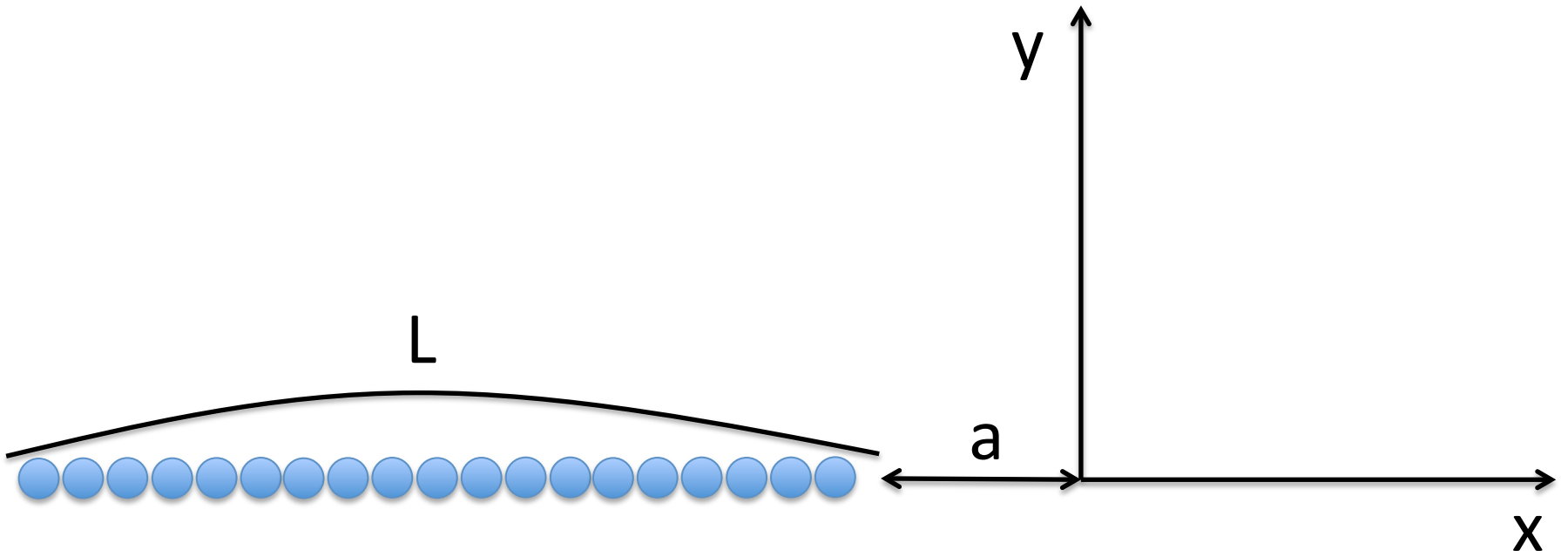
$$\vec{E} = \frac{\vec{F}_{Qq}}{q} = \frac{1}{4\pi\epsilon_0} \frac{Q}{|\vec{r}_{12}|^2} \hat{r}_{12}$$

Lecture 3

More complex example

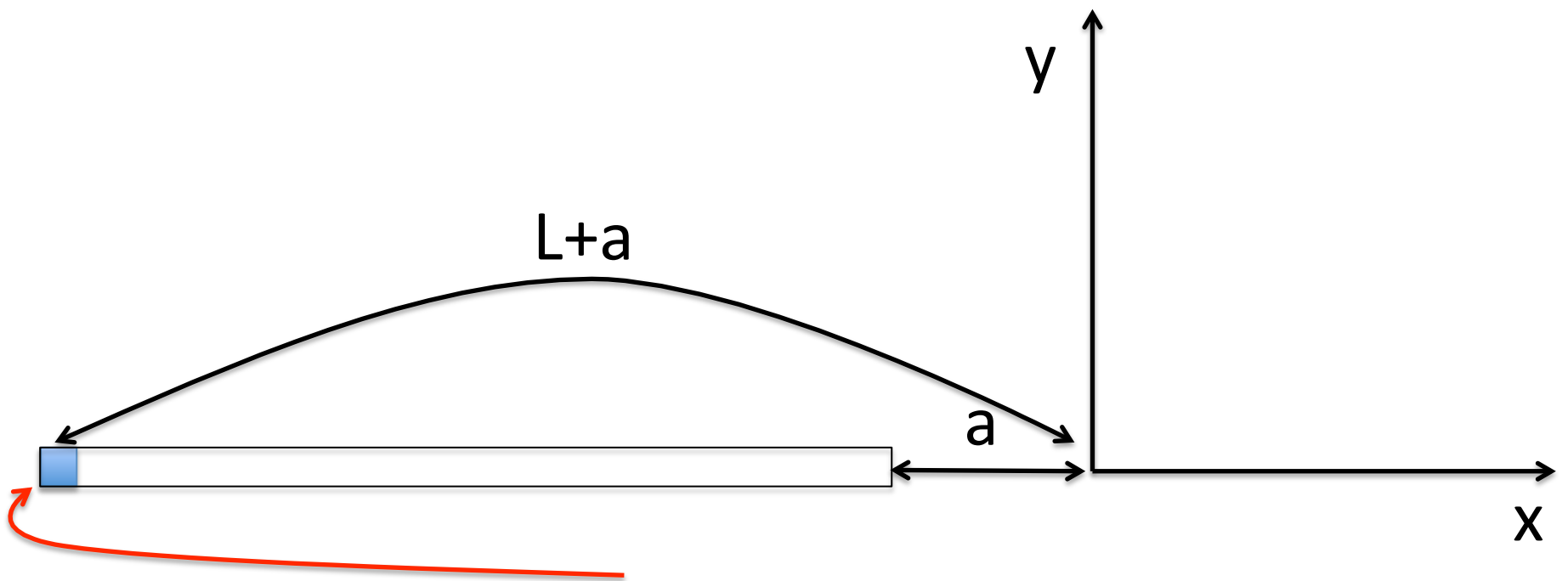


How do you solve this?



We could solve this:

Show on the doc cam: step by step:



Length of this segment : dx

Define amount of charge on this small segment: dq

Define electric field exerted by this segment: dE

$$\int dE = E_{total}$$

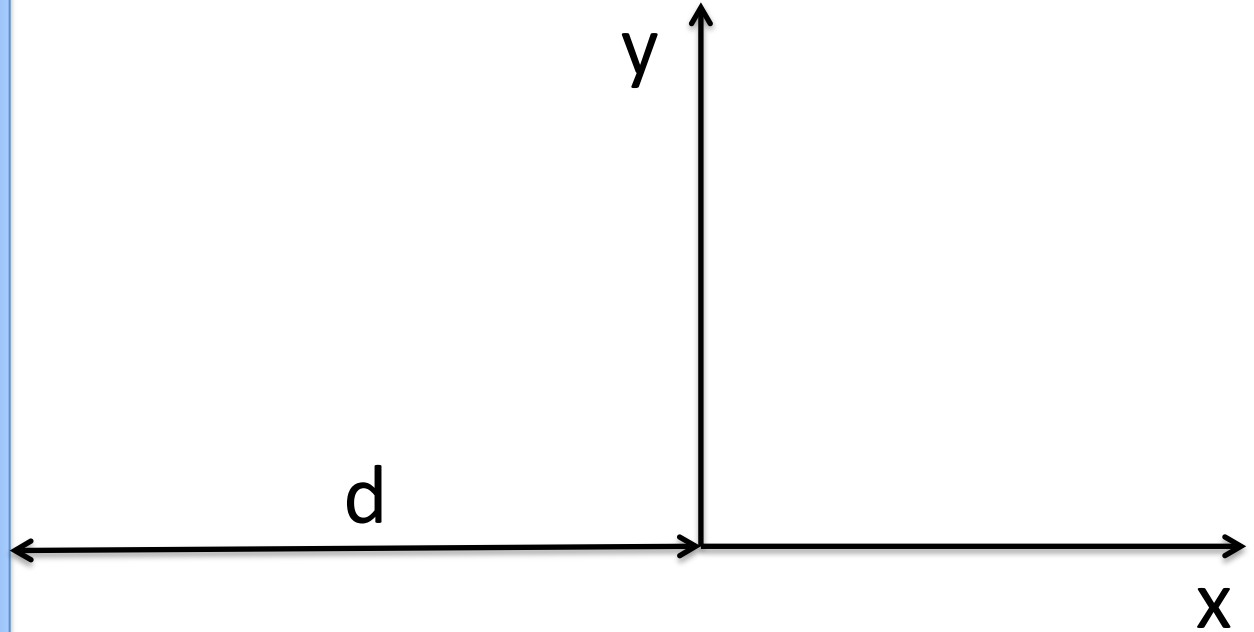
But how do we do this integration?

Total charge = Q : charge per length : Q/L

$$dq = \frac{Q}{L} dx$$

Example 2

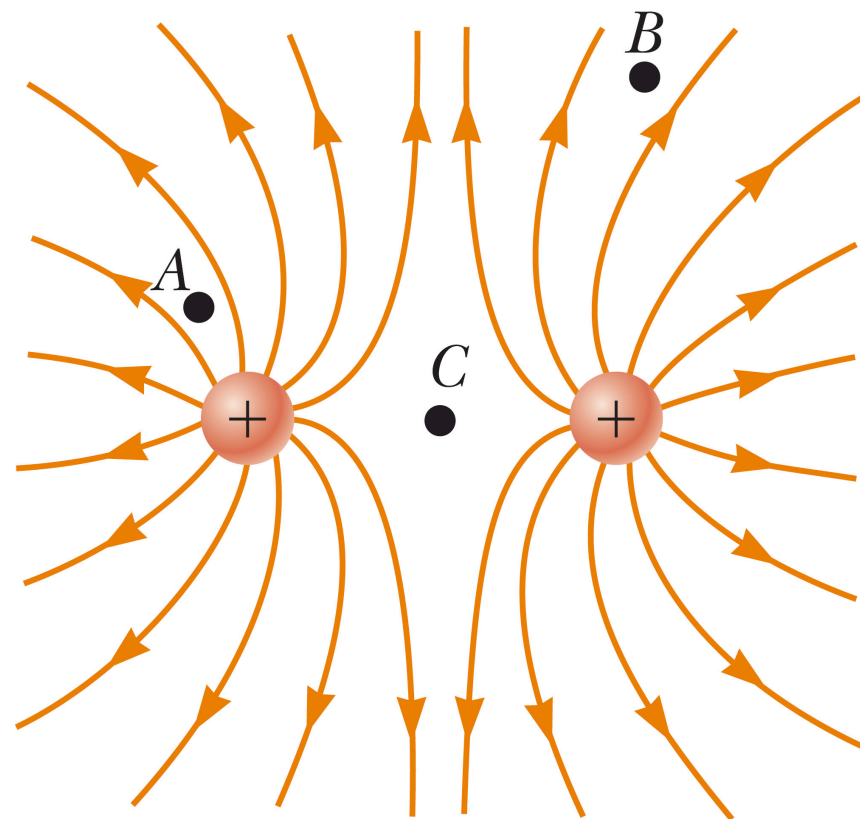
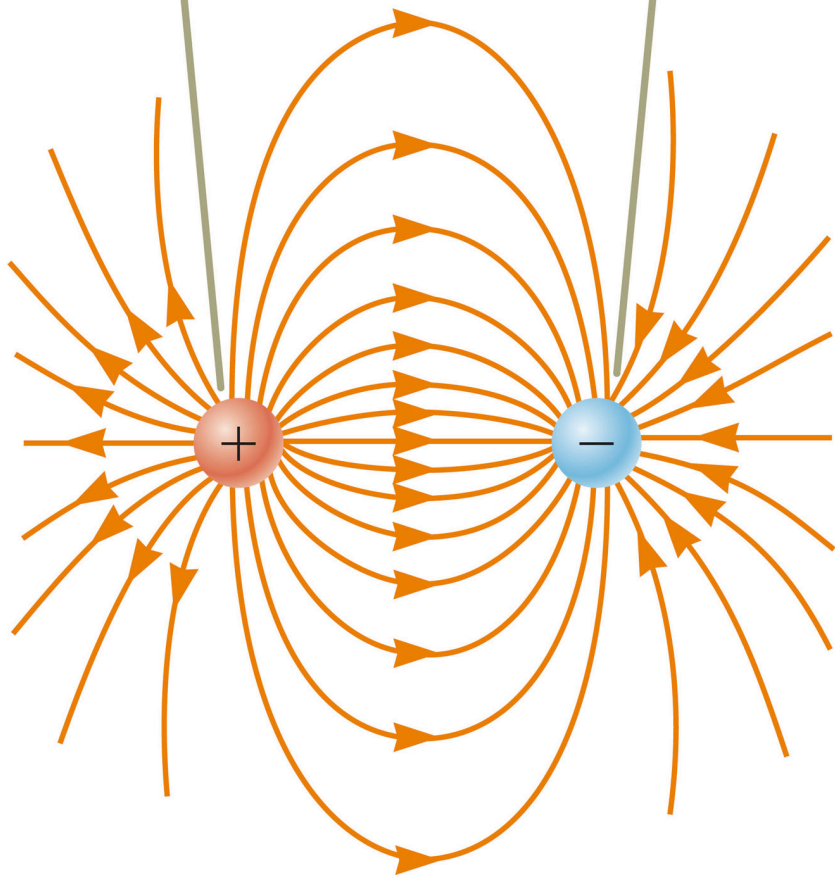
Infinitely long uniformly charged rod



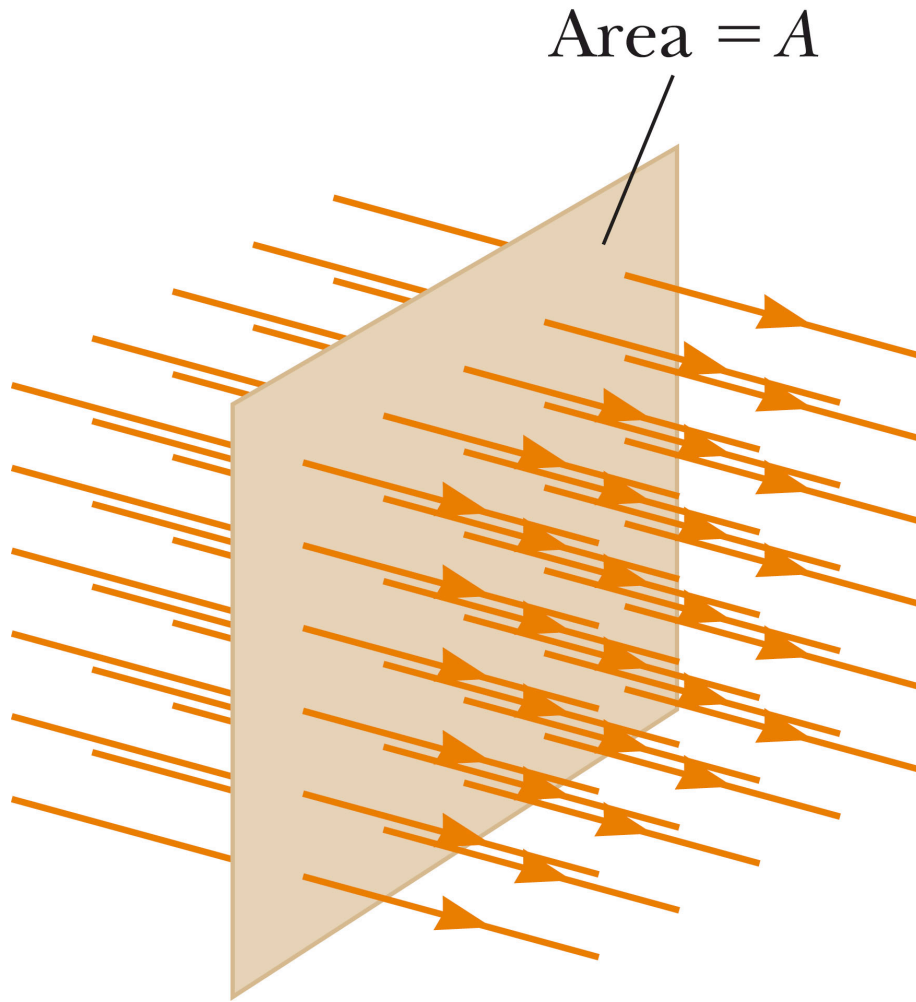
Charge per unit length: λ

Electric Field Lines

The number of field lines leaving the positive charge equals the number terminating at the negative charge.



Electric Flux

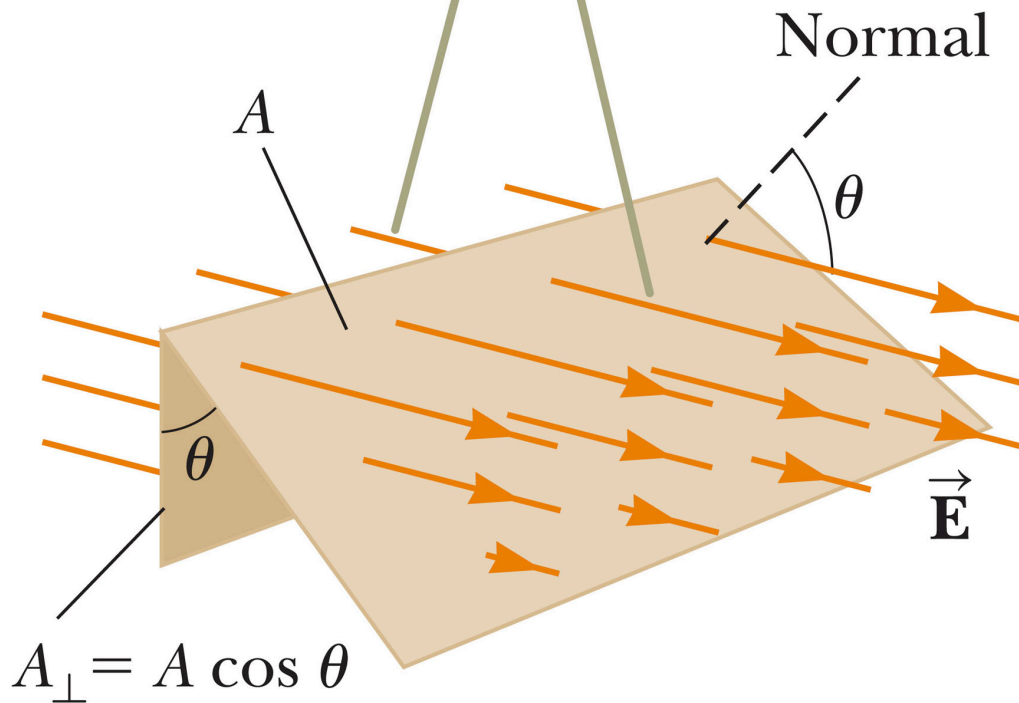


Area = A

$$\Phi = EA$$

Flux: $\text{N m}^2/\text{C}$

The number of field lines that go through the area A_{\perp} is the same as the number that go through area A .



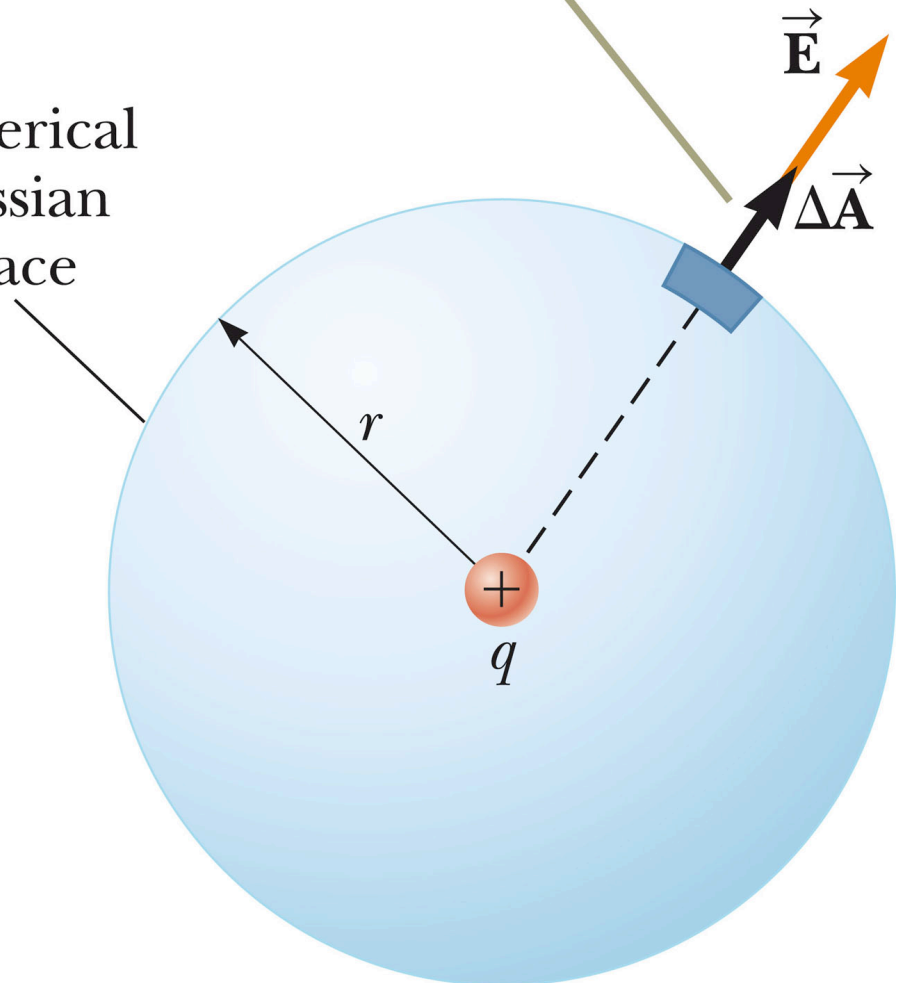
What if the plane in question is tilted?

Gauss's Law

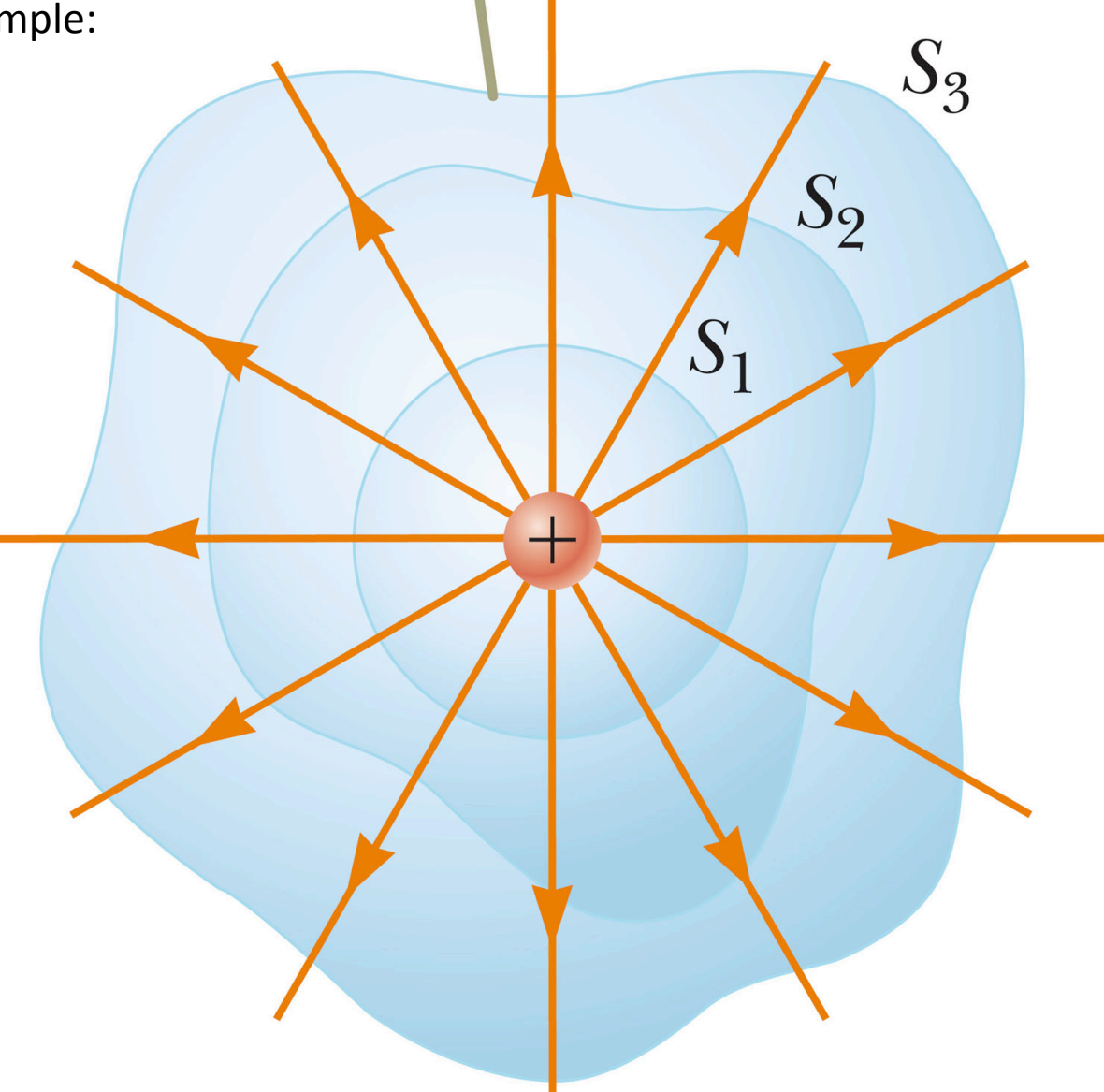
When the charge is at the center of the sphere, the electric field is everywhere normal to the surface and constant in magnitude.

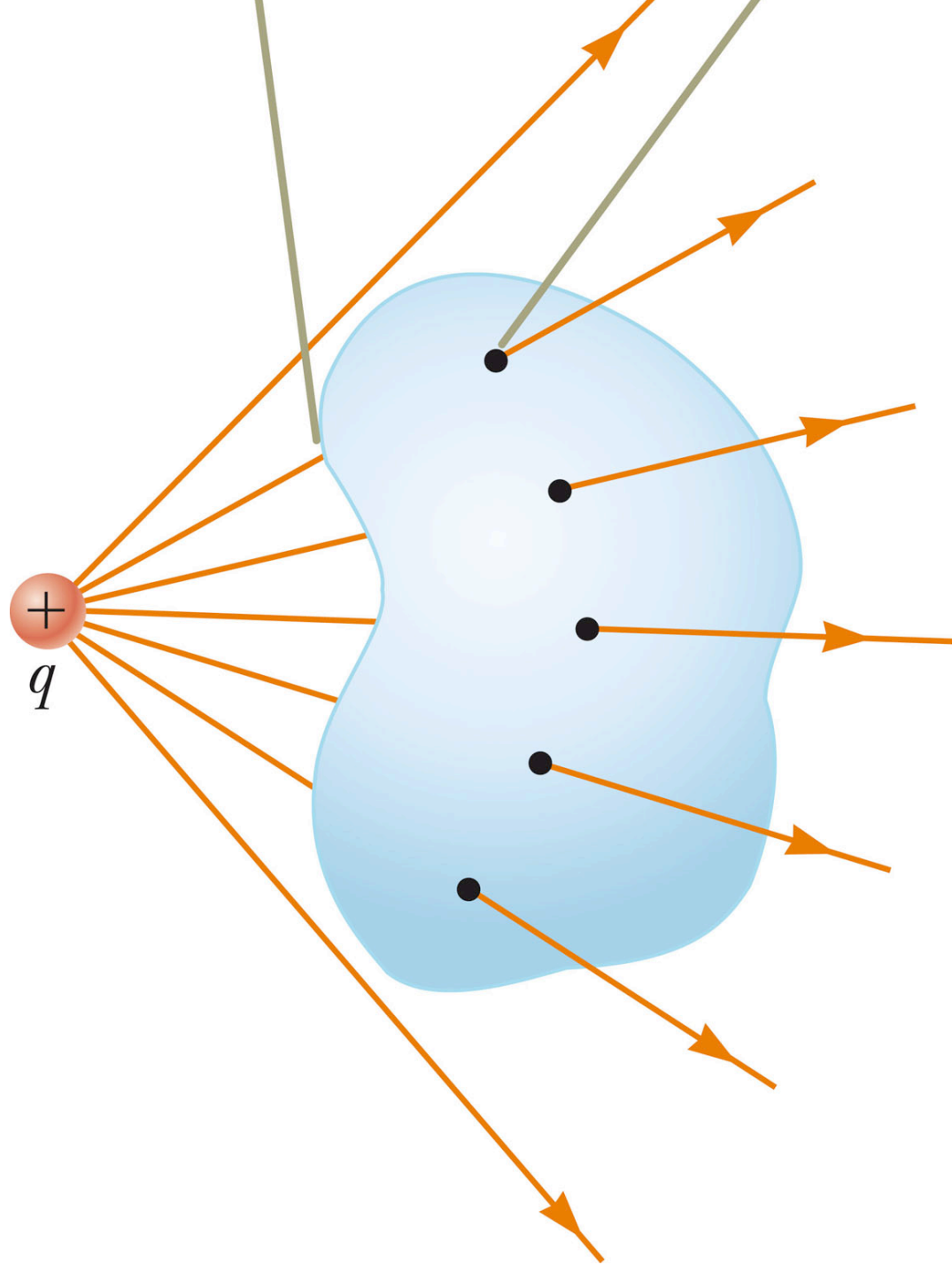
Example: Point charge q

Spherical
gaussian
surface



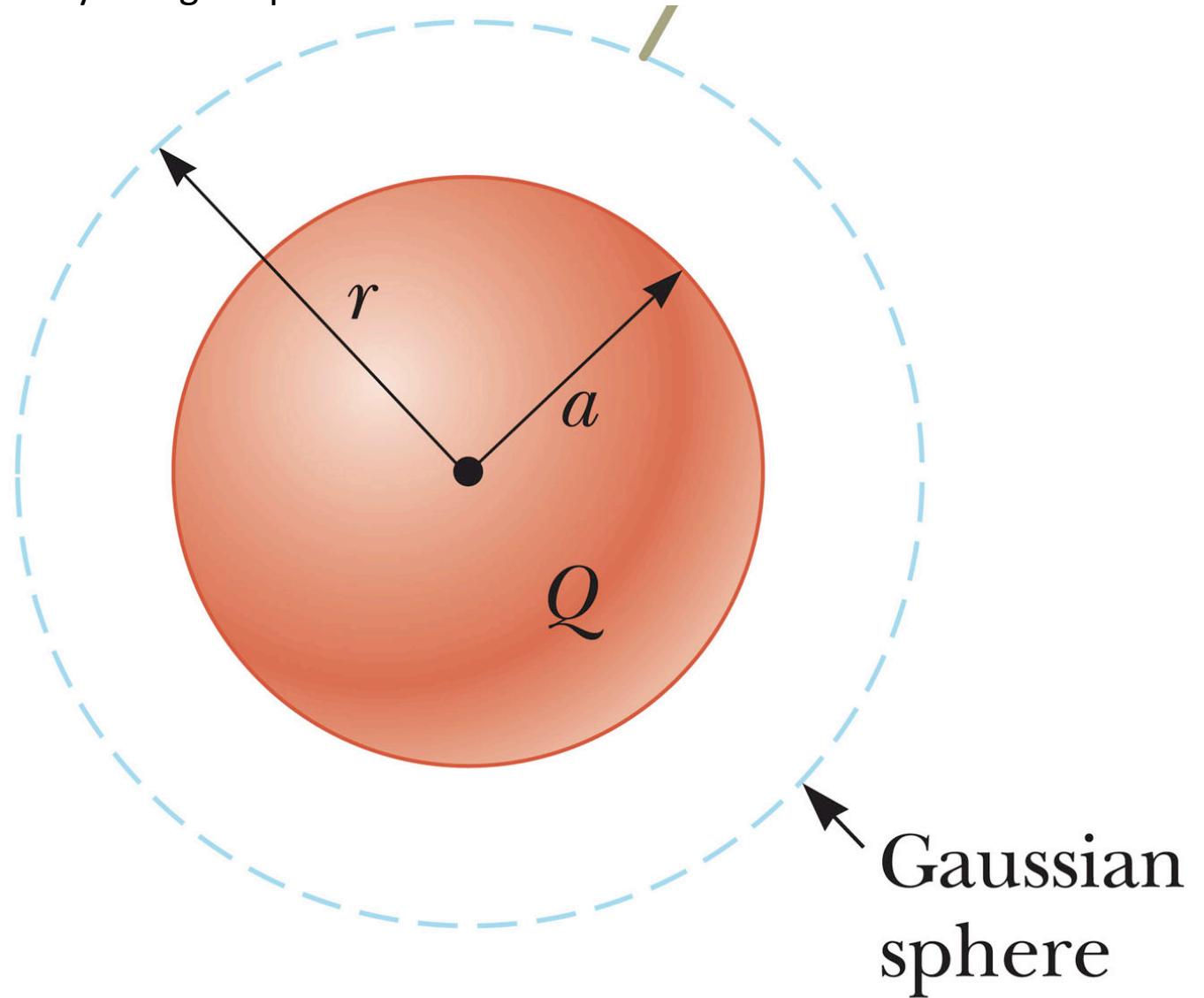
Another Example:





More Drawing example

Example: Uniformly charged sphere



Example: uniformly charged infinite line charge

