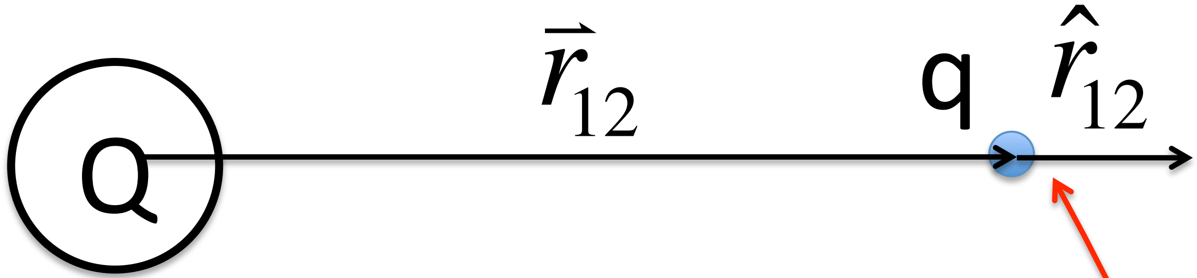
Electric Field



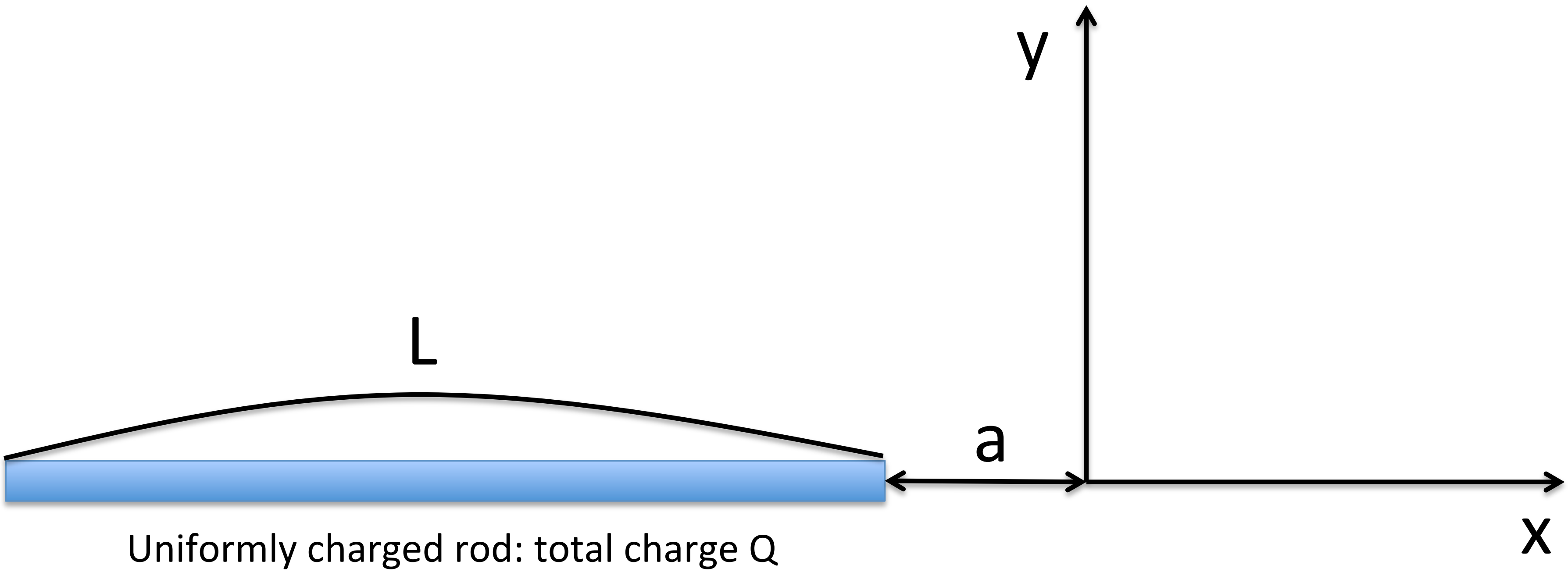
Force on q by Q $\vec{F}_{Qq} = \frac{1}{4\pi\varepsilon_0} \frac{Qq}{|\vec{r}_{12}|^2} \hat{r}_{12}$

Definition of Electric field: at this point is

$$\vec{E} = \frac{\vec{F}_{Qq}}{q} = \frac{1}{4\pi\varepsilon_0} \frac{Q}{|\vec{r}_{12}|^2} \hat{r}_{12}$$

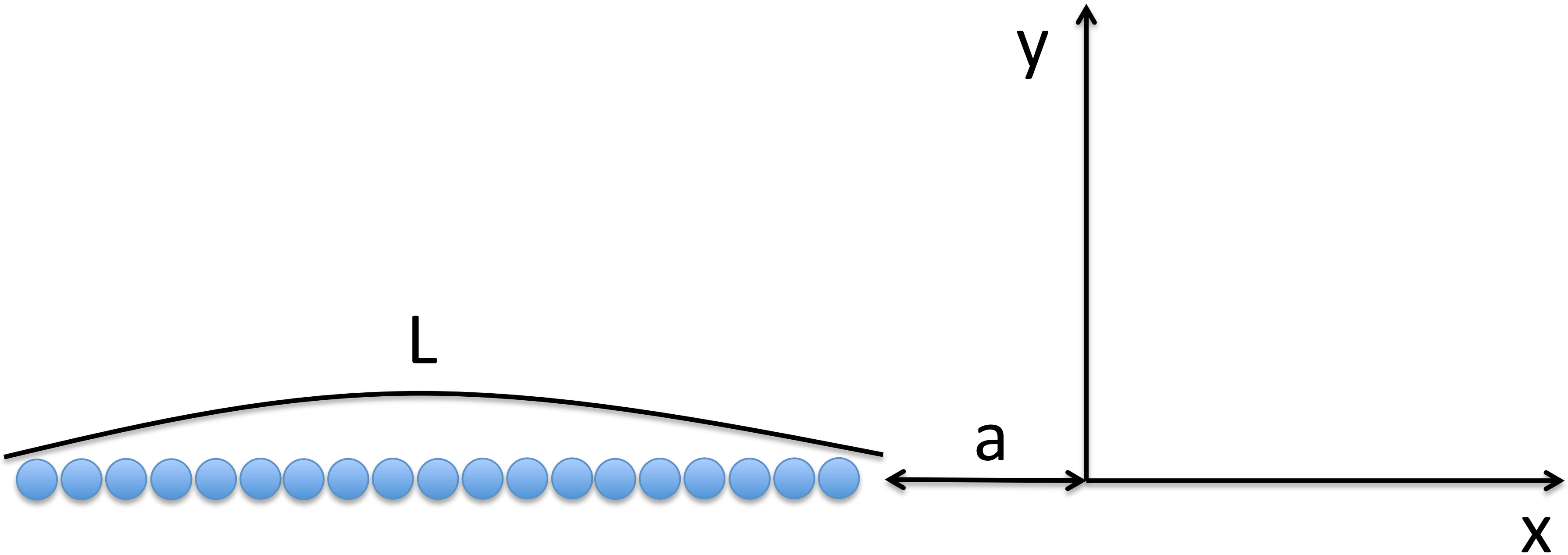
Lecture 3

More complex example



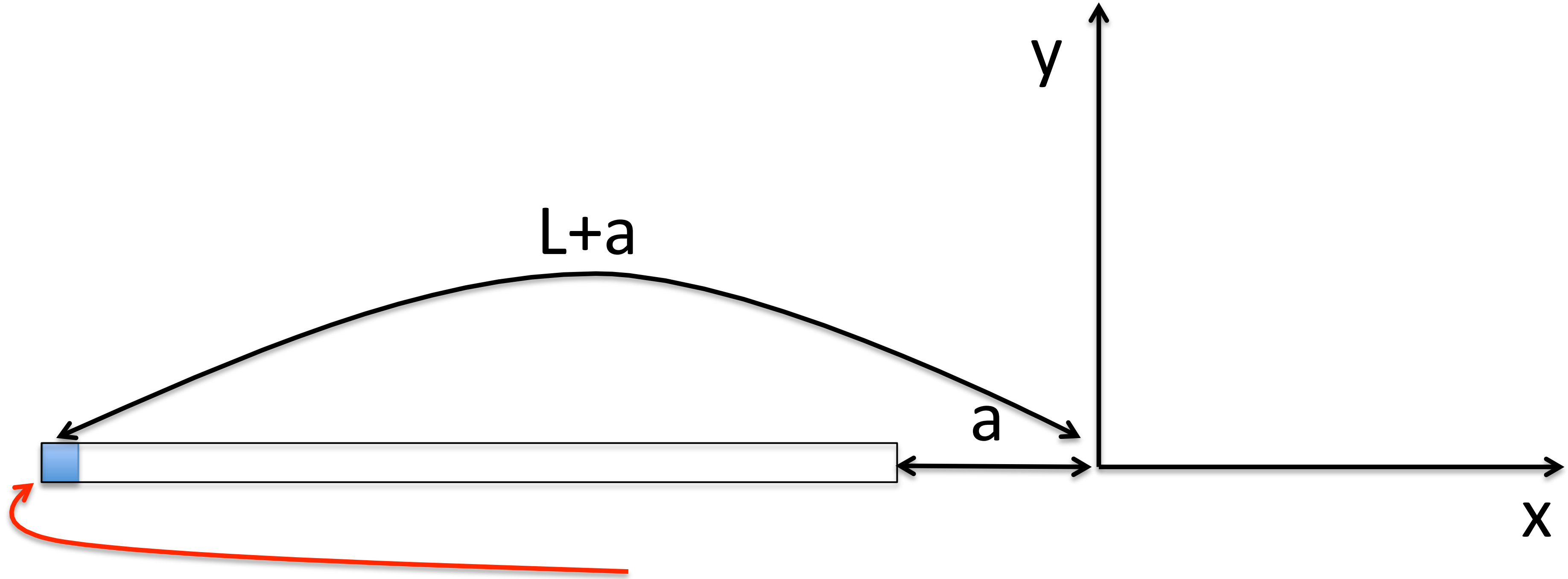
Uniformly charged rod: total charge Q

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

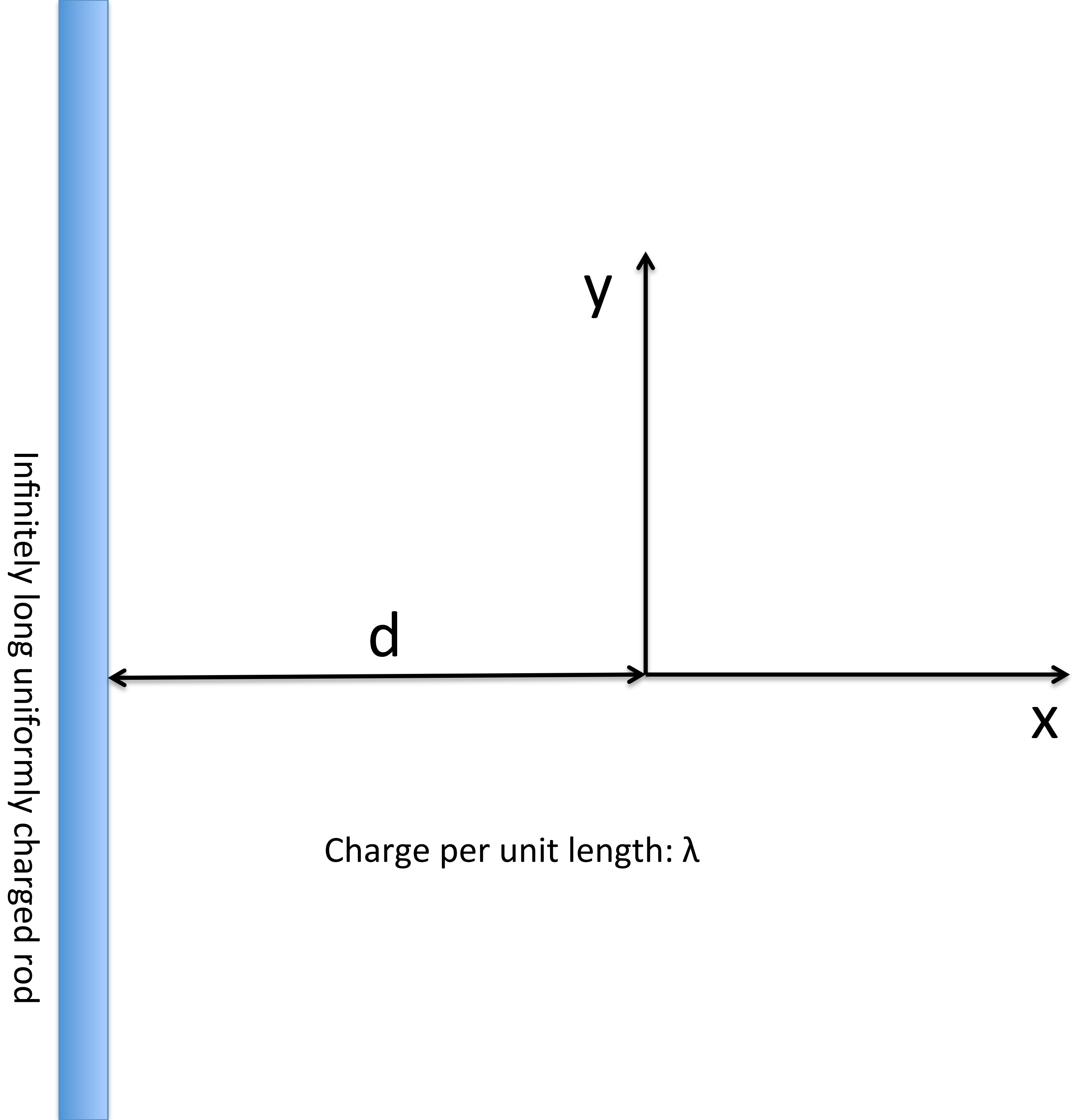
$$\int dE = E_{total}$$

But how do we do this integration?

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

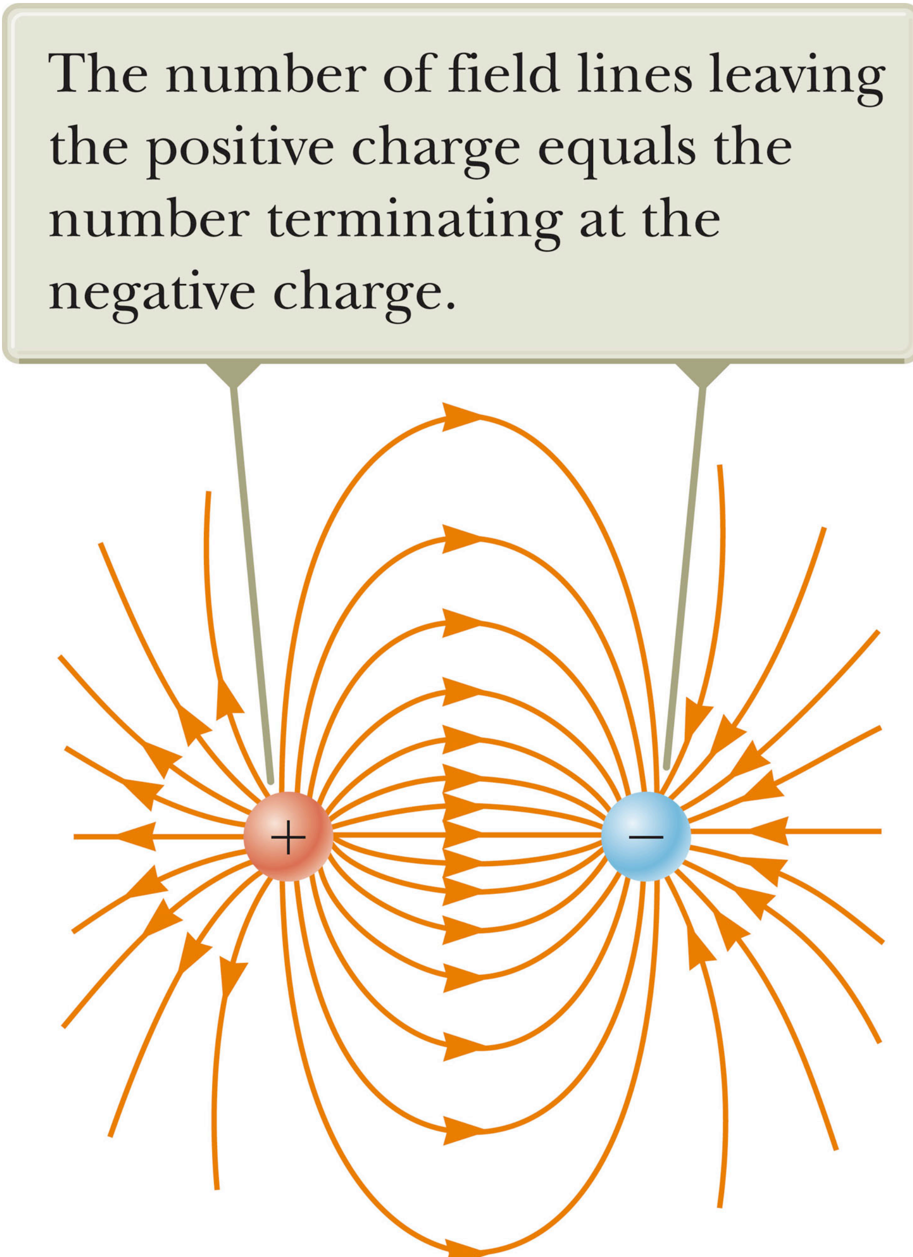
$$dq = \frac{Q}{L}dx$$

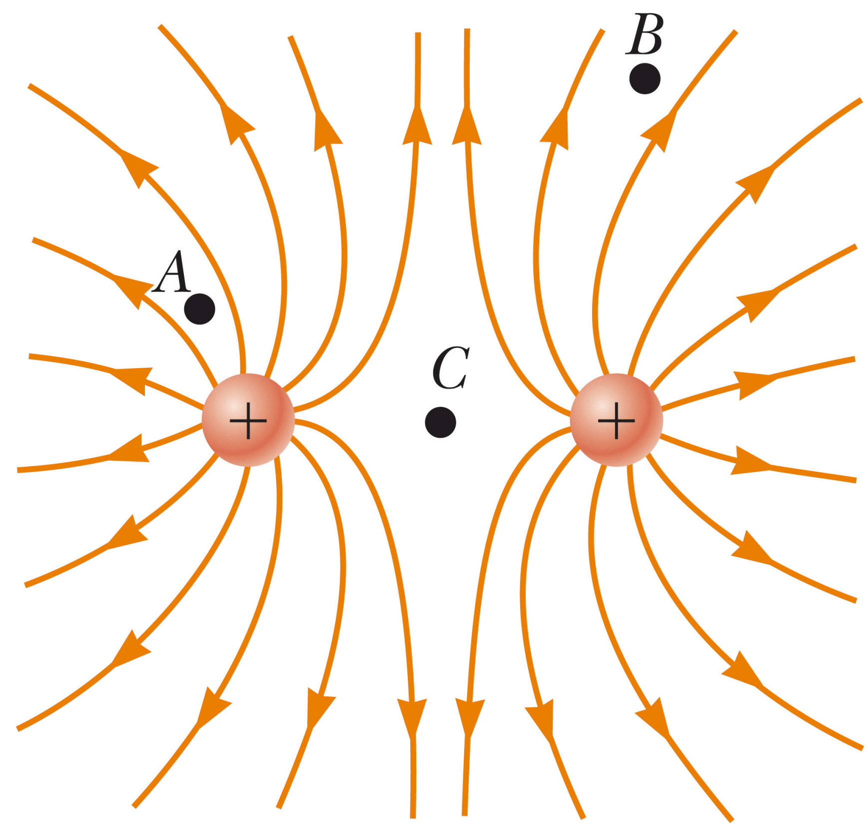
Example 2



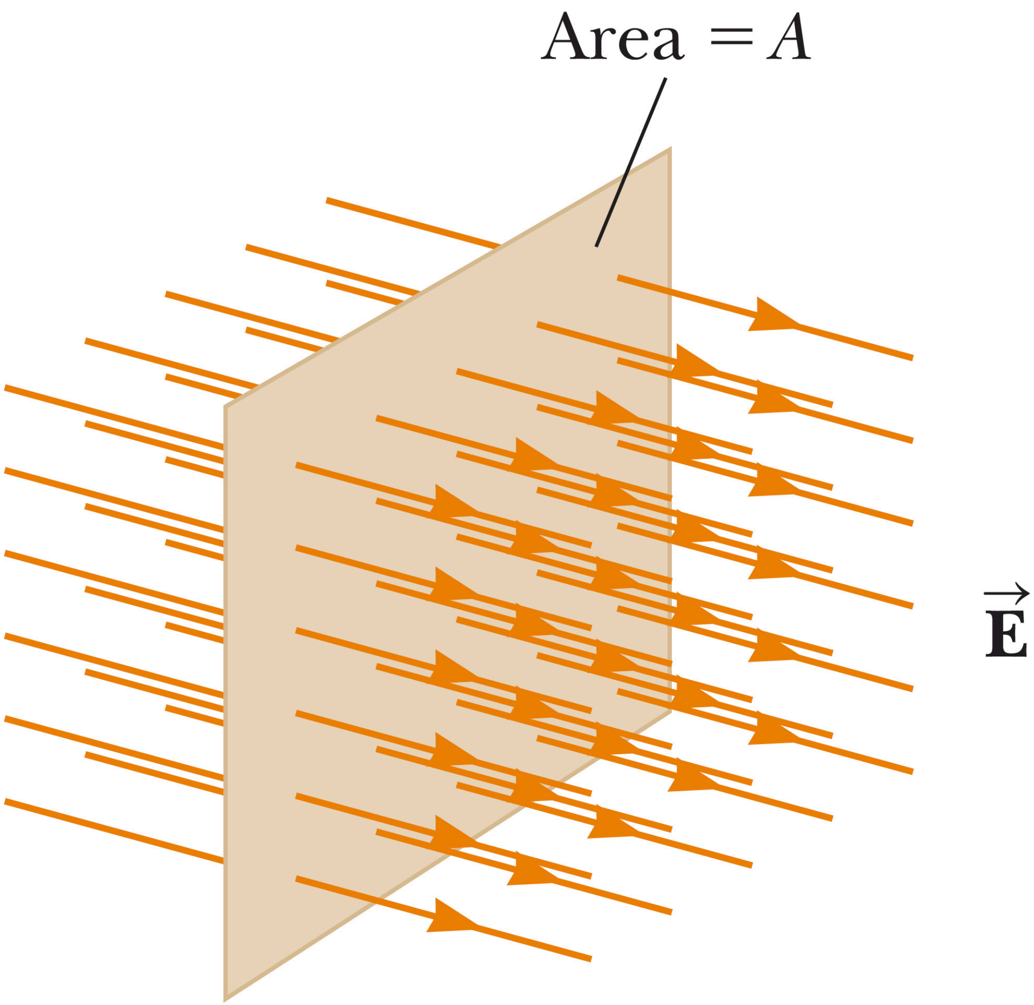
Charge per unit length: λ

Electric Field Lines


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

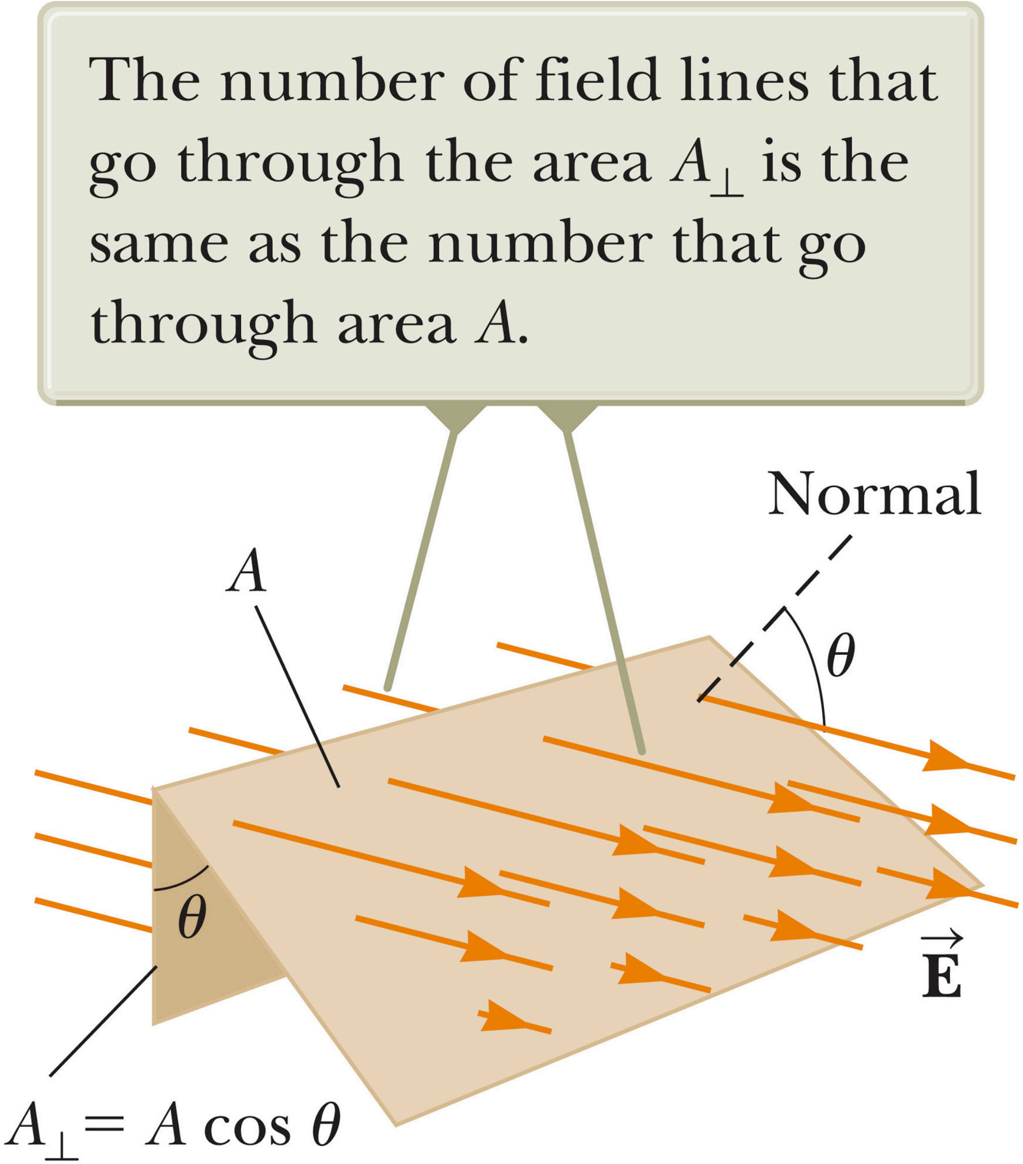

A
B
C
+
+

Electric Flux



$$\Phi = EA$$

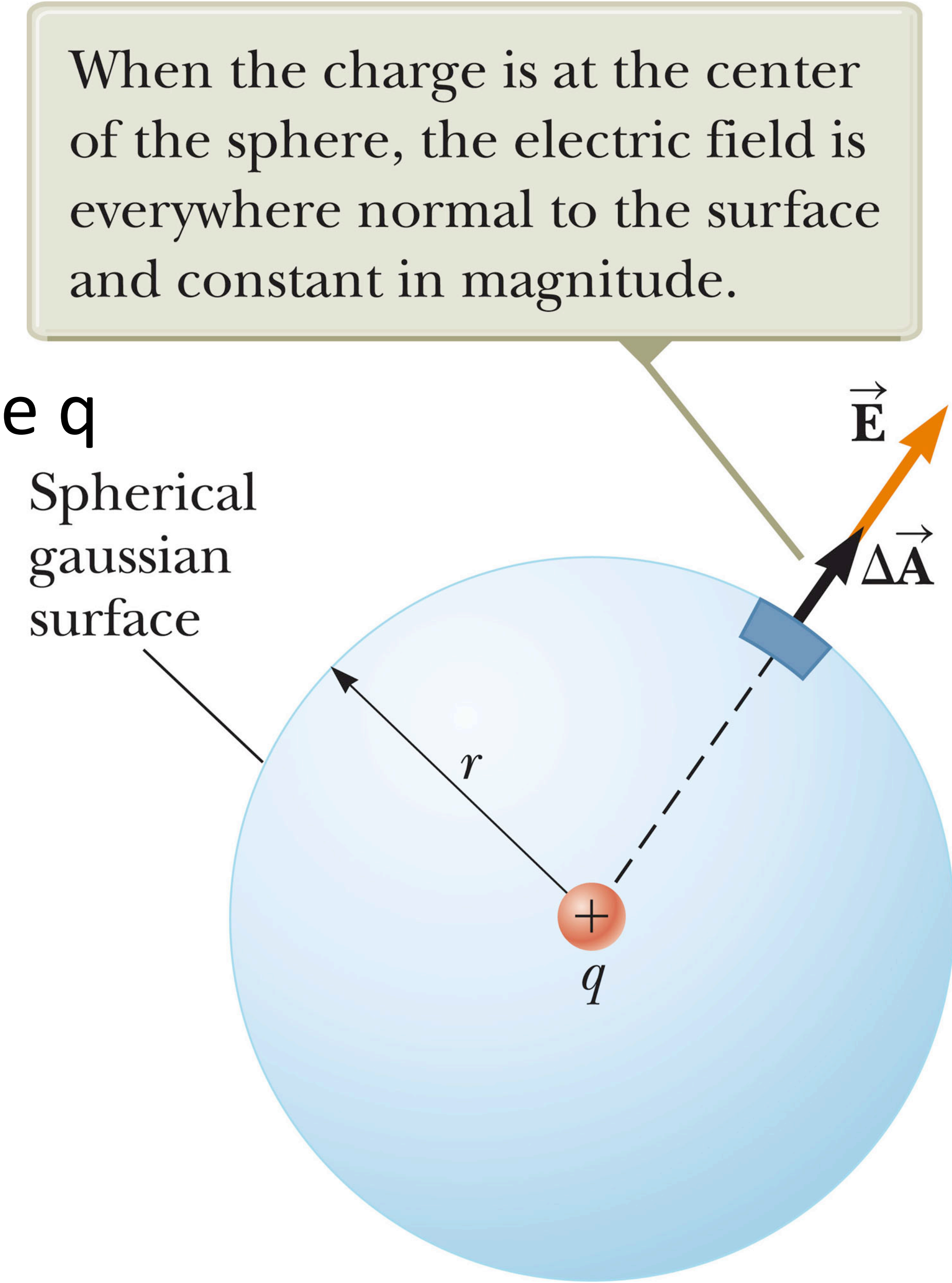
Flux: N m^2/C



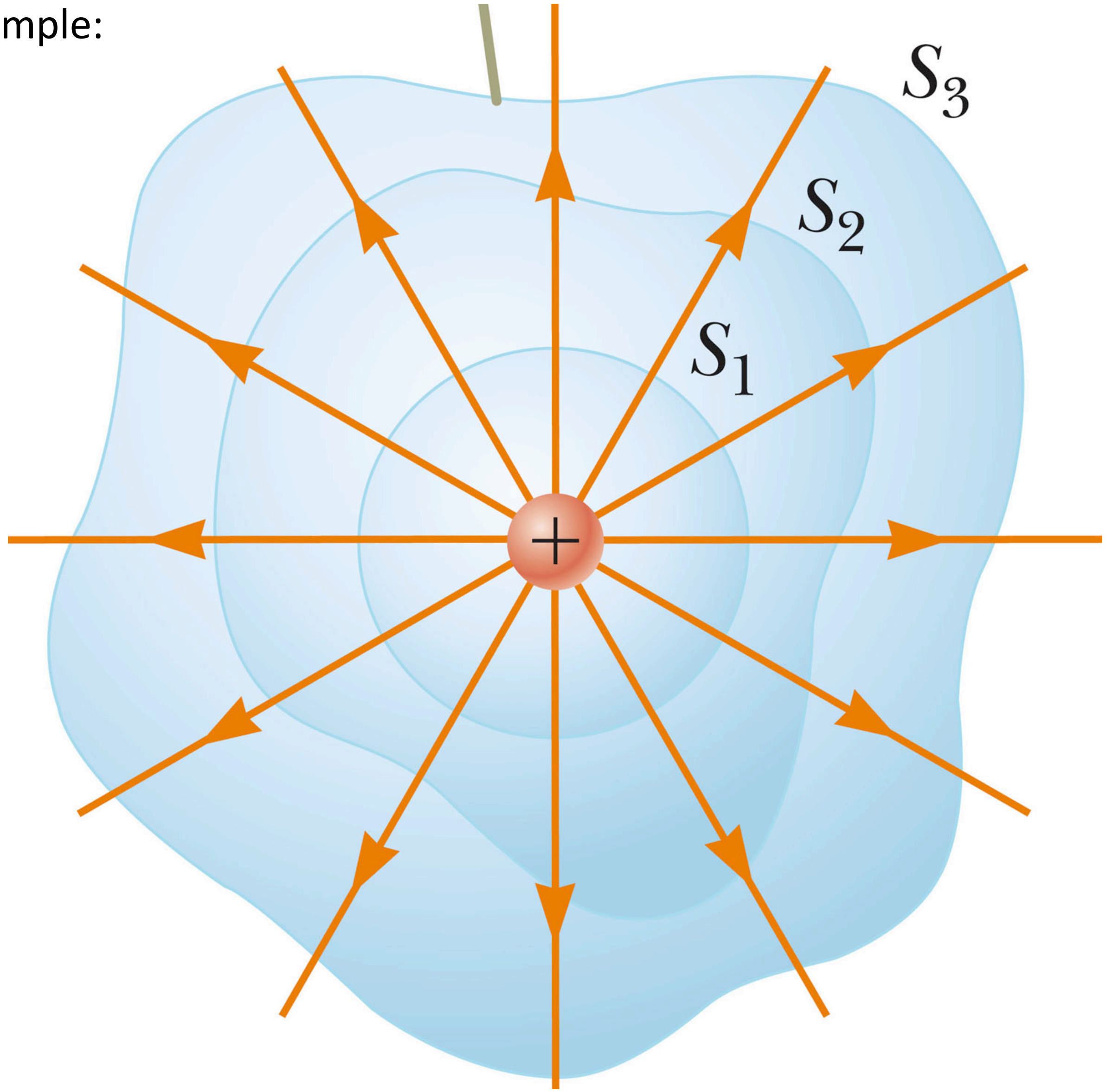
What if the plane in question is tilted?

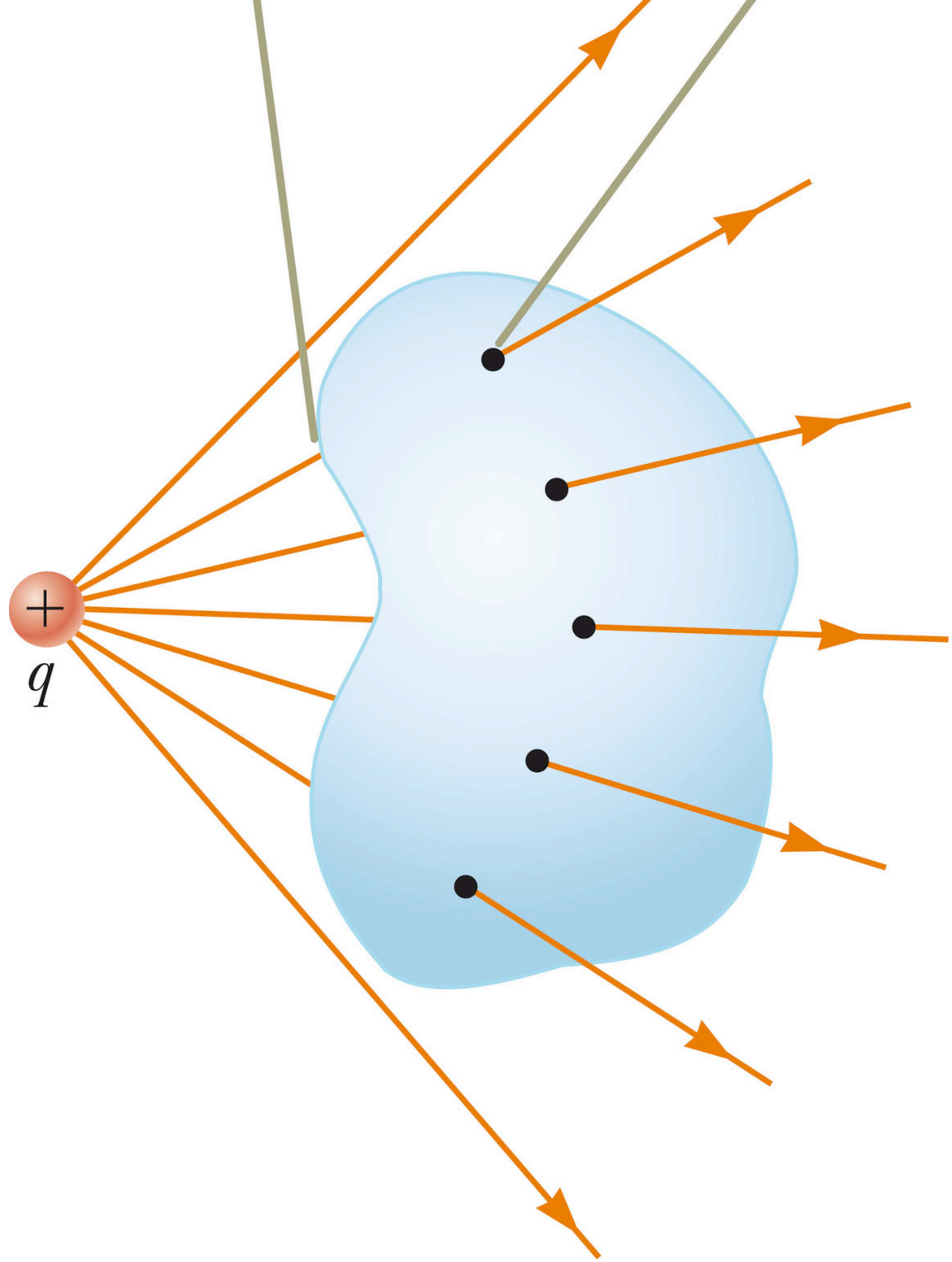
Gauss's Law

Example: Point charge q



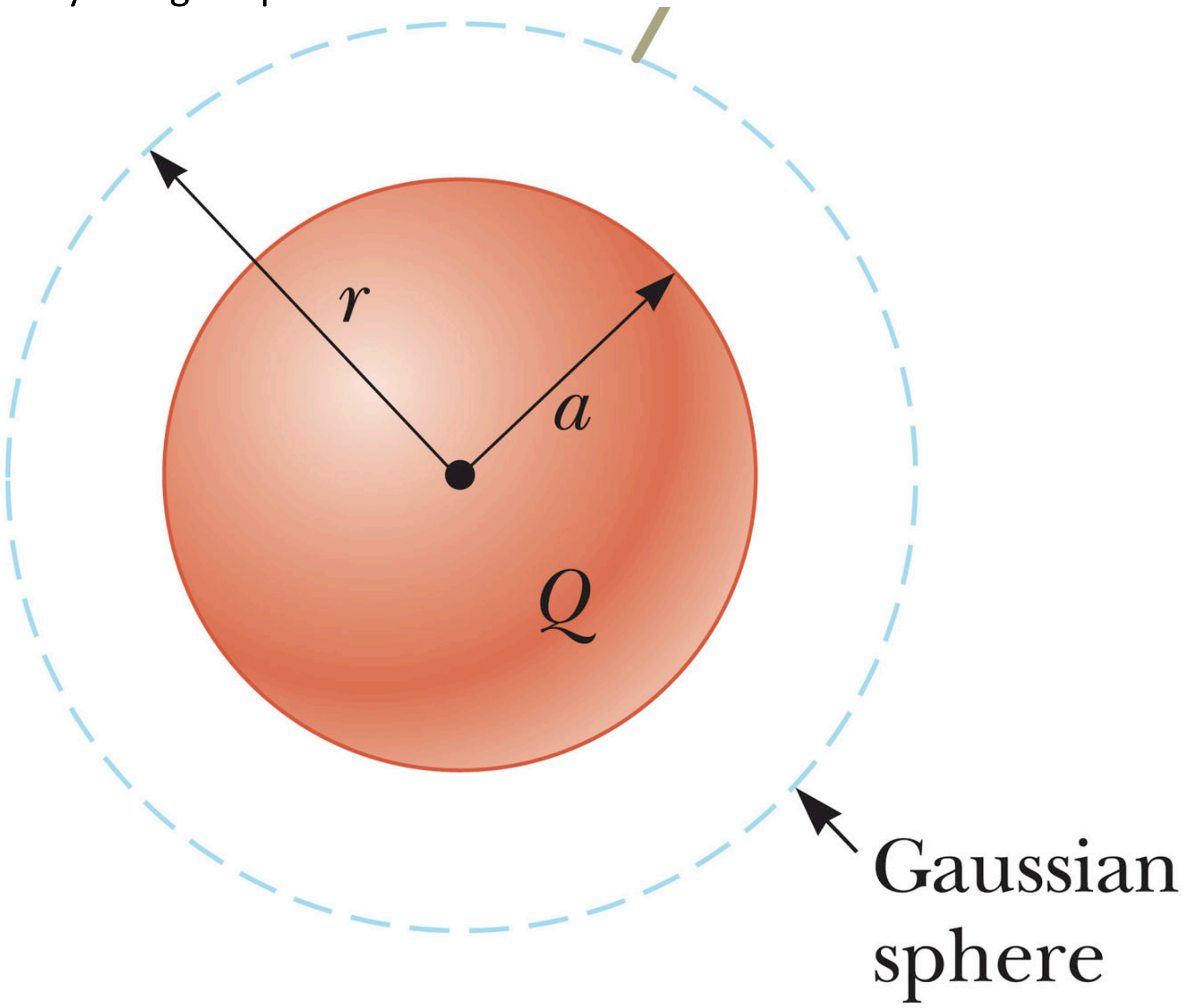
Another Example:




q

More Drawing example

Example: Uniformly charged sphere



Example: uniformly charged infinite line charge