Reading for next time

- 22-1: Calculating E from Coulomb's Law

Physics 122 Labs Sections begin on next week

Before your section meets

- Get a copy of the lab manual at the UW Bookstore!
- Read the information on page iii as it has a lot of information related to the course, the course website, WebAssign, etc.
- Get a WebAssign account (Pay by credit card only)

There are 3 components to the labs:

- **Pre-Labs**: Needs to be completed before each of your lab sessions begin. Pre-labs will be completed in WebAssign
- **In-class Experiment**: This is your lab section in which you will need your lab manual.
- **Post-Labs**: Completed after your lab session also on WebAssign

(Lab) Course website:

- http://courses.washington.edu/phys122z/index.php
- Please check the Frequently Asked Questions (FAQs) link before you email the Instructor!

Compute the force on a charge…

- Use the definition of the Electric field:

$$\vec{E} \equiv \frac{\vec{F}_{\mathrm{Net},0}}{q_0}$$

$$\vec{F}_{\mathrm{Net},0} = q_0 \vec{E}$$

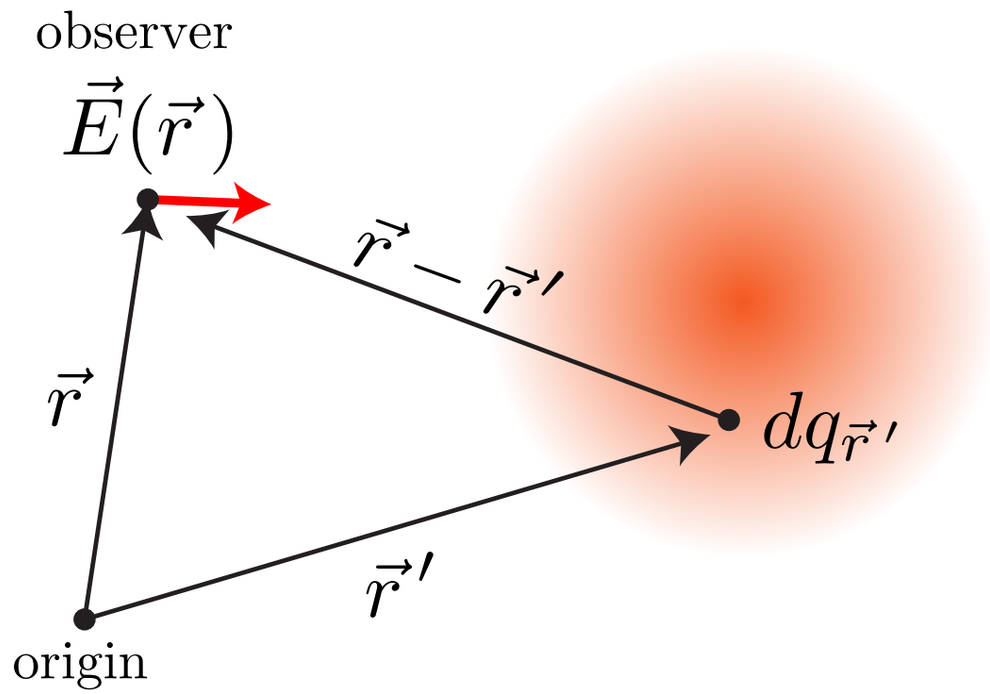
E field from a charge distribution

- **Electric Field** from a collection of charges:

$$\vec{E}(\vec{r}_0) = \sum_{j \neq 0} \frac{k\ q_j}{r_{j,0}^2} \hat{r}_{j,0}$$

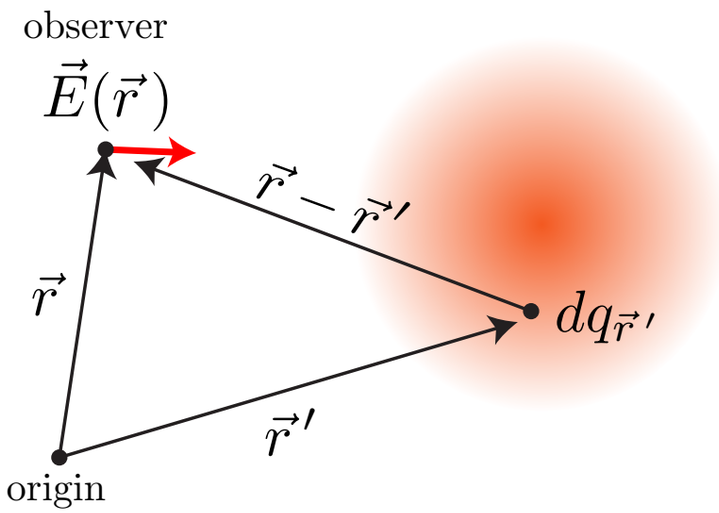
- **Electric Field** from a continuous charge distribution:

$$\vec{E}(\vec{r}) = k \int dq_{\vec{r}\,\prime}\ \frac{\vec{r} - \vec{r}\,\prime}{|\vec{r} - \vec{r}\,\prime\,|^3}$$



E field from a charge distribution

$$\vec{E}(\vec{r}) = k \int dq_{\vec{r}\,\prime} \, \frac{\vec{r} - \vec{r}\,\prime}{|\vec{r} - \vec{r}\,\prime\,|^3}$$

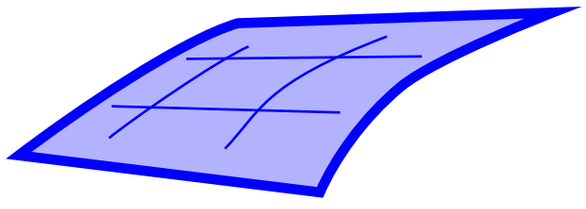


- **Electric Field** from a 1D source: [λ] = C/m[1]

$$dq_{\vec{r}\,\prime} \to d\ell \, \lambda(\vec{r}\,\prime)$$

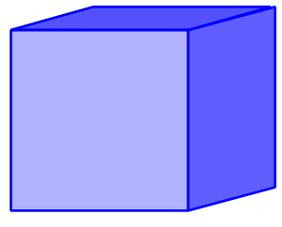
- **Electric Field** from a 2D source: [σ] = C/m^2

$$dq_{\vec{r}\,\prime} \to d^2x \, \sigma(\vec{r}\,\prime)$$



- **Electric Field** from a 3D source: [ρ] = C/m^3

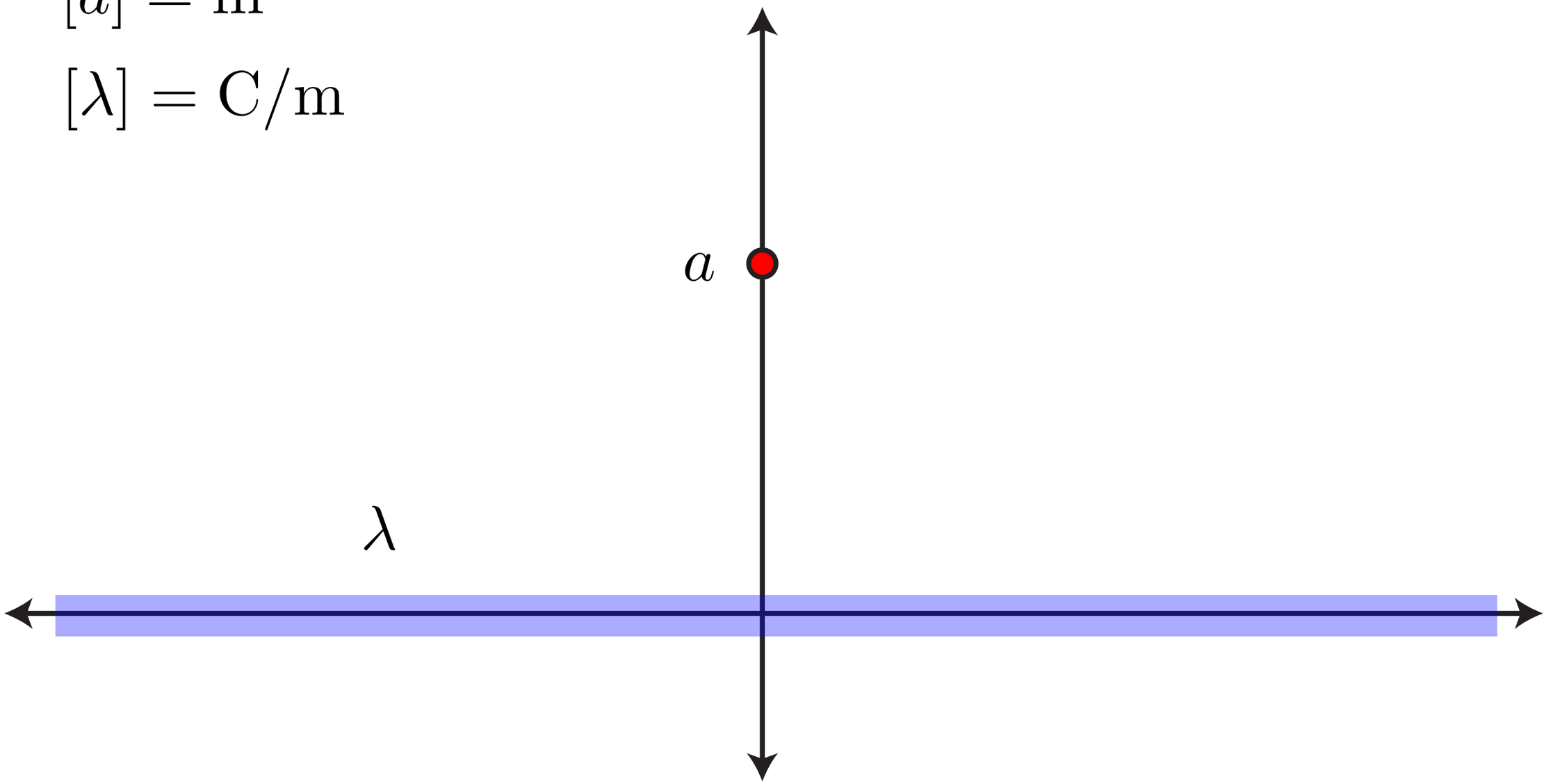
$$dq_{\vec{r}\,\prime} \to d^3x \, \rho(\vec{r}\,\prime)$$



E field from a line charge

$$[a] = \mathrm{m}$$

$$[\lambda] = \mathrm{C/m}$$



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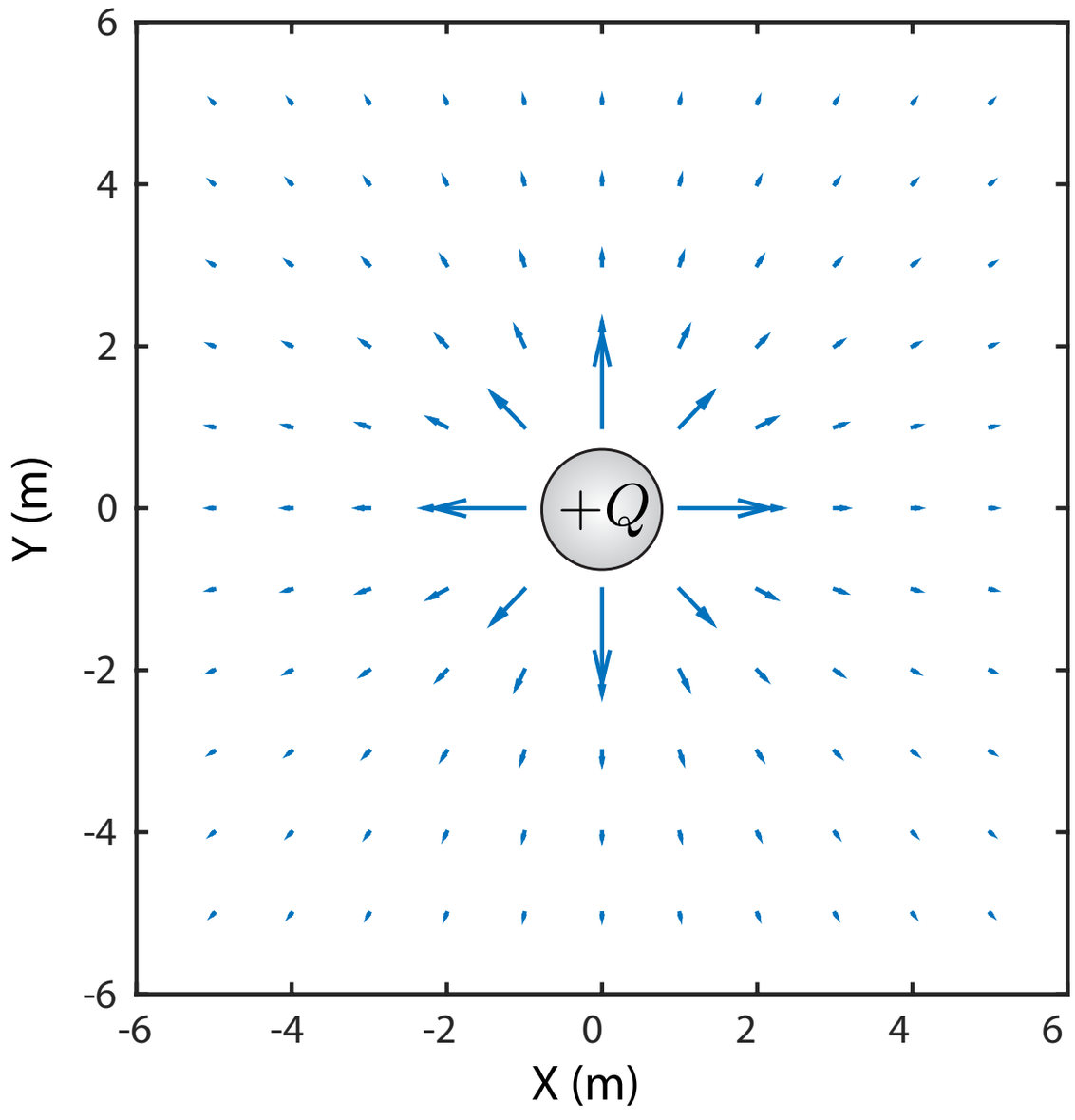
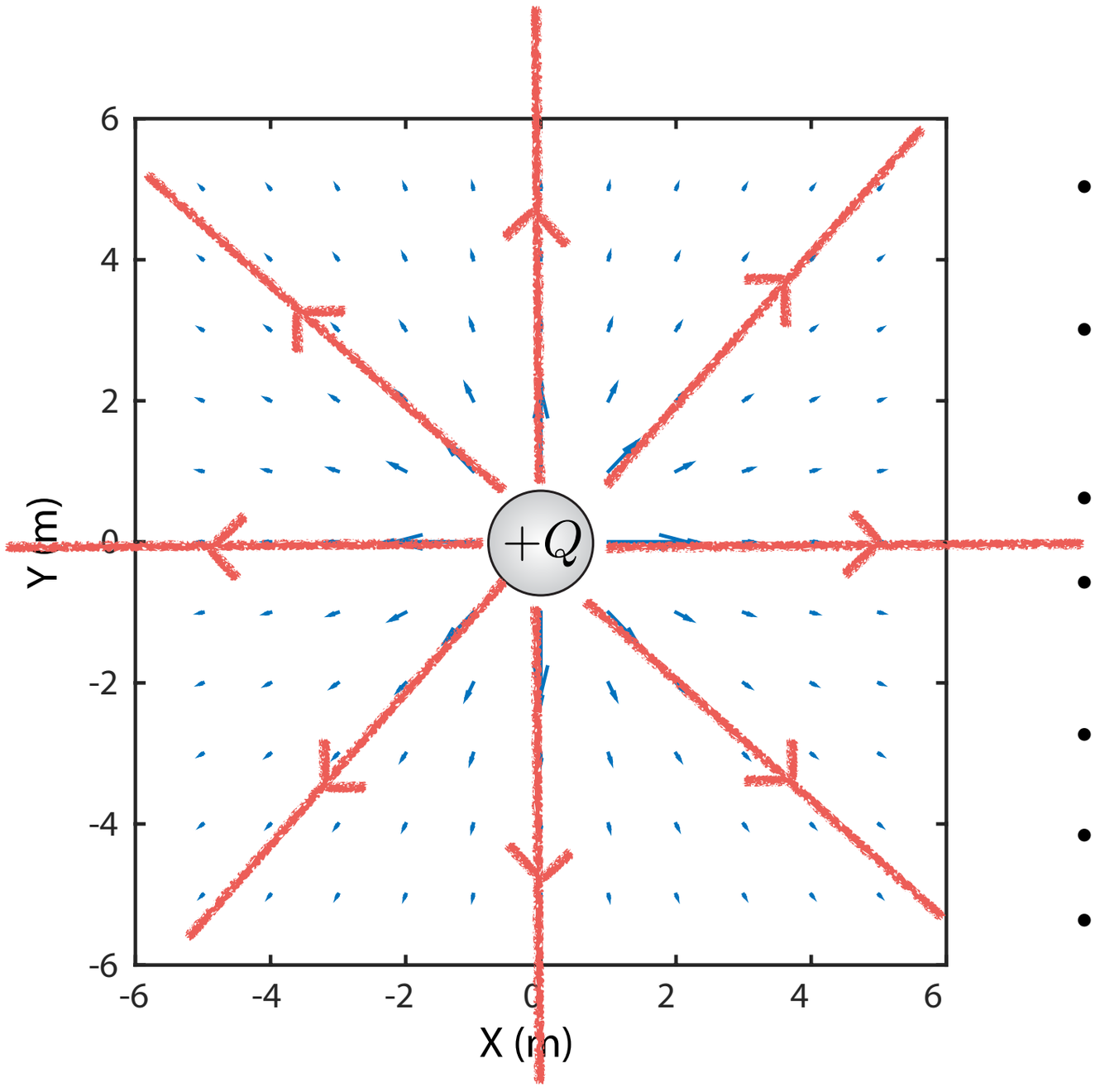
Work the integral…

E field lines



- Lines start/end at +/- charges (or ∞)
- Number of lines starting/ending is ∝ |charge|
- Lines emanating/terminating are uniformly spaced
- Density of lines is ∝ |E|
- Lines are tangent to E field
- Lines are radial and equally spaced →∞

E field lines



- Lines start/end at +/- charges (or ∞)
- Number of lines starting/ending is ∝ |charge|
- Arrow is the direction of the Field
- Lines emanating/terminating are uniformly spaced
- Density of lines is ∝ |E|
- Lines are tangent to E field
- Lines are radial and equally spaced →∞

Field lines more examples…

Clicker

E field from a dipoles