Worksheet 2A: Charge Distributions

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1 Conceptual Questions

(a) Give examples of symmetric shapes and non-symmetric shapes.

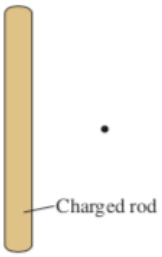
(b) When is the dipole approximation valid?

(c) Describe the dynamics of a dipole placed in a **uniform** electric field.

- Does it experience a force?
- Does it move? If so, how?

(d) At the dot, in what direction does the electric field point?

(e) What are ways to increase the magnitude of the electric field at the dot?



(f) Draw the electric field lines for the positively charged rod above.

(g) How much faster does the $\vec{E}$ field of a point charge decay compared to the $\vec{E}$ field of a charged-thin wire?
HINT: This is a hint.

2 Infinite Charged Wire

Show that the electric field $\vec{E}$ at point P a distance d above an infinite wire with total charge Q is:

$$\vec{E}(P) = \frac{1}{4\pi\epsilon}\int_{-\infty}^{\infty} \mathrm{d}x\ \frac{\lambda x}{(d^2+x^2)^{\frac{3}{2}}}\ \hat{y}$$