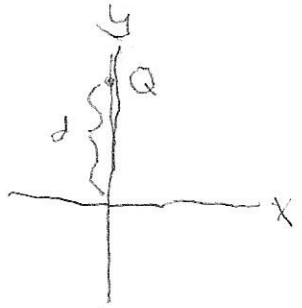

dipole approx $\qquad p = Qd$

$$\vec{E}(\vec{r}) = \frac{Q_{tot}}{4\pi\epsilon_0}\frac{\hat{r}}{r^2} + \frac{1}{4\pi\epsilon_0}\frac{1}{r^3}\left[3(\vec{p}\cdot\hat{r})\hat{r} - \vec{p}\right]$$

$$\text{so } E(\vec{r}) = \frac{Q}{4\pi\epsilon_0}\frac{\hat{r}}{r^2} + \frac{1}{4\pi\epsilon_0}\frac{1}{r^3}\left[2Qd\right]$$

$$= \frac{Q}{4\pi\epsilon_0 r^2}\hat{r} + \frac{2Qd}{4\pi\epsilon_0 r^3} = \frac{Q}{4\pi\epsilon_0 r^2}\left[\hat{r} + 2\frac{d}{r}\right]$$