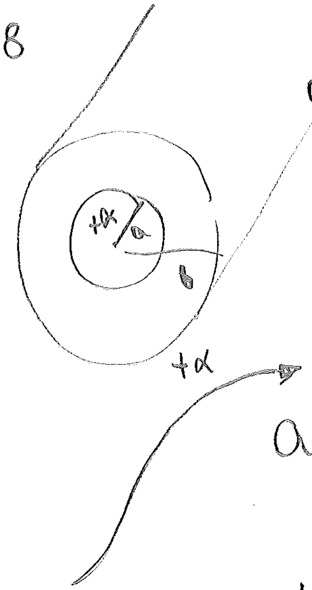
22.38



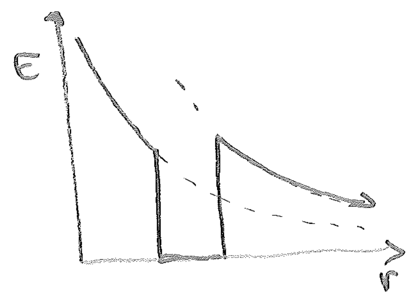
a) In between $\oint E\,dA = \frac{\alpha \ell}{\epsilon_0} = E \cdot 2\pi r \ell$

(i) $E = \frac{\alpha}{2\pi r \epsilon_0}$

In conductor, $E = 0$ (ii)

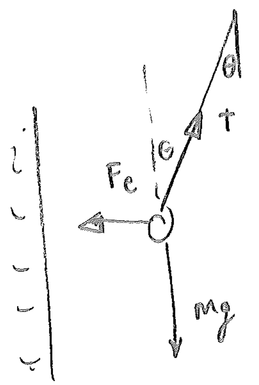
(Note: inner conductor surface has charge dens $= -\alpha$)

Outside $E = \frac{2\alpha}{2\pi r \epsilon_0}$ (iii)



b) outer conductor surface $= +2\alpha$

22-41.

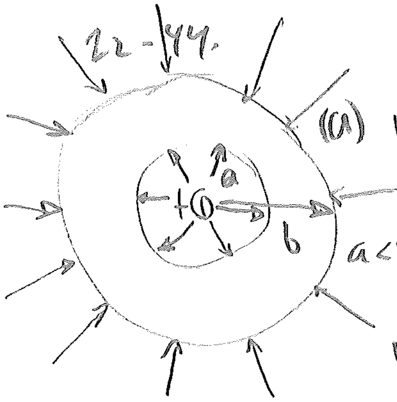


$\tan\theta = \frac{F_e}{mg} = \frac{qE}{mg}$

$E_{\infty\ \text{sheet}} = \frac{\sigma}{2\epsilon_0} \rightarrow \theta = 19.8^0$

Sheet must be insulating or charges would move in response to sphere!

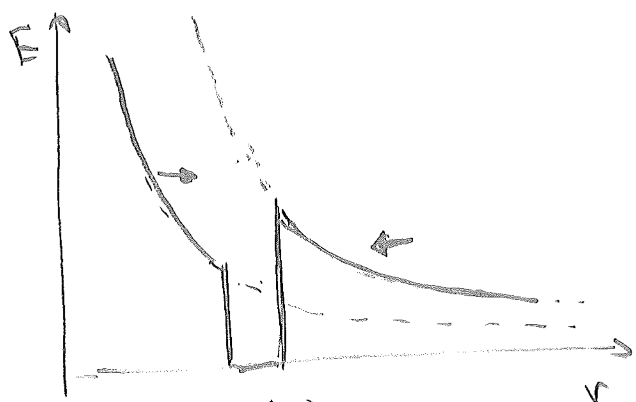
22-44.



(a) $r < a$. $E = \frac{1}{4\pi\epsilon_0}\frac{Q}{r^2}$ Gauss' law

$a < r < b$ $E = 0$ conductor

$r > b$ $E = \frac{1}{4\pi\epsilon_0}\frac{-2Q}{r^2}$



(e)

(b) inner surface $\Rightarrow \frac{-Q}{4\pi a^2} = \sigma_i$

(c) outer surface $\Rightarrow \frac{-2Q}{4\pi b^2} = \sigma_o$

(d) Field lines shown. Note: twice as many end on outer surface as inner surface!