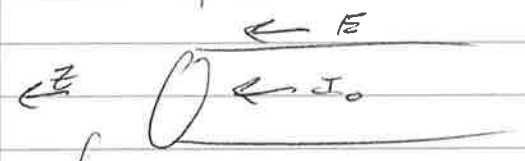
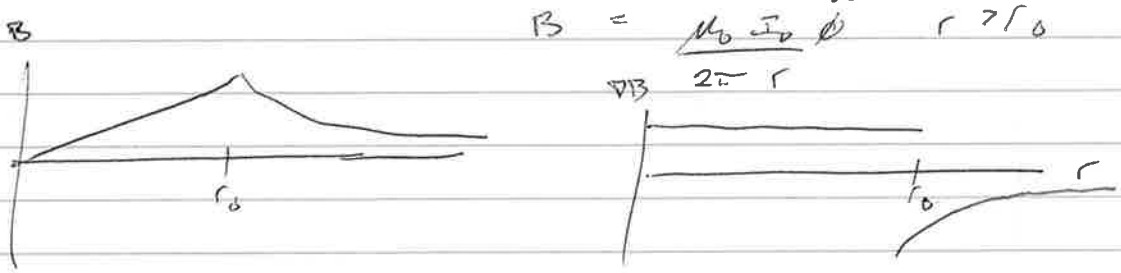
2011 Day 1 Question 1A (GPP)



a. $\oint B \cdot dl = \mu_0 I_{enc}$

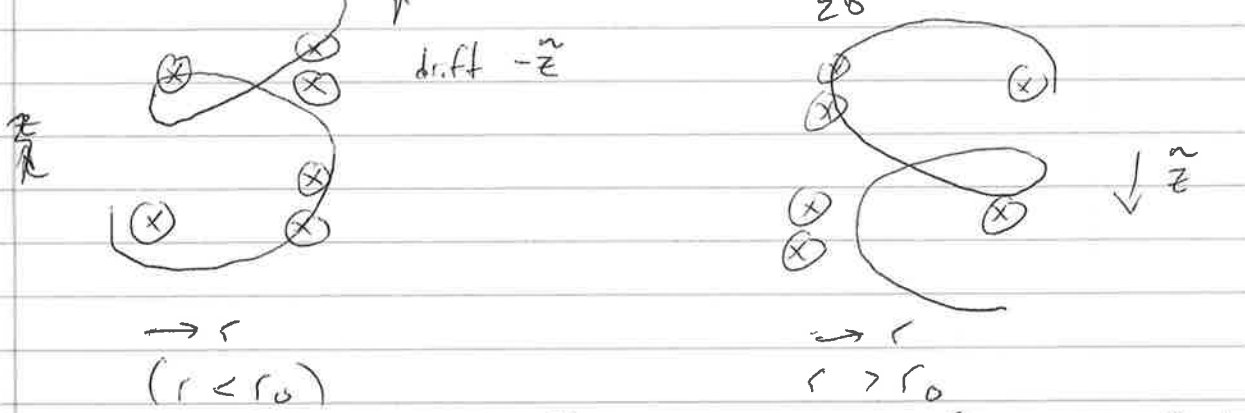
$2\pi r B = \mu_0 I_0 \frac{r^2}{r_0^2}$ $\quad B = \frac{\mu_0 I_0}{2\pi} r \hat{\phi}$ $\quad r < r_0$

$B = \frac{\mu_0 I_0}{2\pi r} \hat{\phi}$ $\quad r > r_0$



b. $v = \frac{E \times B}{B^2}$ with drift ~~radially outwards~~ $\tilde{z}$ $\quad v_{dB} \sim \frac{B \times dB}{}$

$r_L = \frac{m v}{qB}$



c. $E > 0$, add $E \times B$ drift. Points in $\hat{z} \times \hat{\phi} = -\hat{r}$ for both

d. $E \times B$ radial drift will vanish exactly at $r = 0$.
Yes I think they should "reach" $r \geq 0$, though that is obviously not a stable position — it will inevitably drift with gyromotion along $-\hat{z}$.