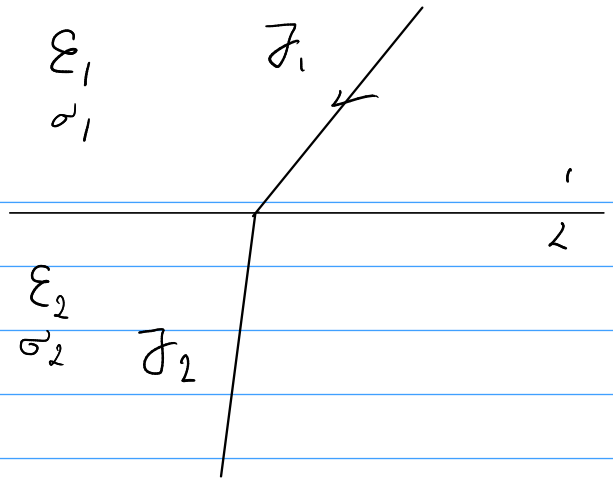
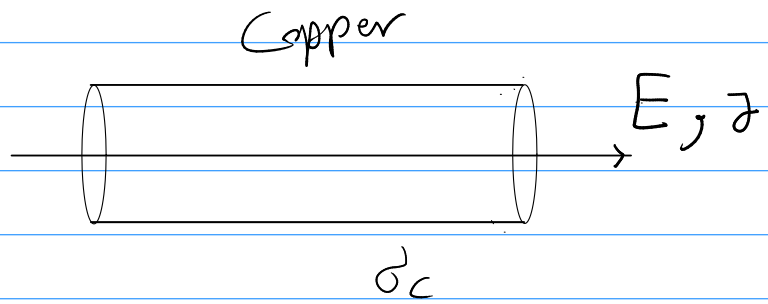
7.3 & 7.4

$D_{2n} - D_{1n} = \rho_s$

$\varepsilon_2 \frac{J_2}{\sigma_2} - \varepsilon_1 \frac{J_1}{\sigma_1} = \rho_s$





Convection Current: $\vec{J} = \rho_v \vec{u}$

Steady cont: $\frac{I}{\pi r_0^2} \hat{x} = -q_e N_e \vec{u}$

$\vec{u} = -I / \pi r_0^2 q_e N_e \hat{x}$

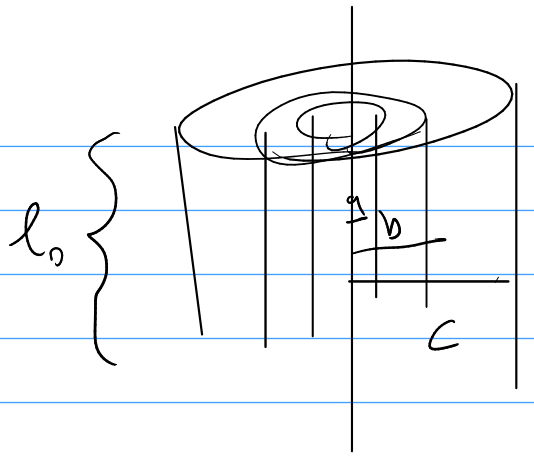
$\vec{E} = \frac{\vec{J}}{\sigma}$

7.8 $J = \sigma E$, $\Delta V = RI$, $R = \frac{l}{\pi r^2 \sigma}$

S/m
$m^{-1} \Omega^{-1}$

$G(S) = \frac{1}{R} (\Omega)$

7.9



① $R_{ab} = R_a \parallel R_b$

$$= \frac{l_0}{\sigma_a \pi a^2} \parallel \frac{l_0}{\sigma_b \pi (b^2 - a^2)}$$

$$= \frac{1}{\frac{\sigma_a \pi a^2}{l_0} + \frac{\sigma_b \pi (b^2 - a^2)}{l_0}}$$

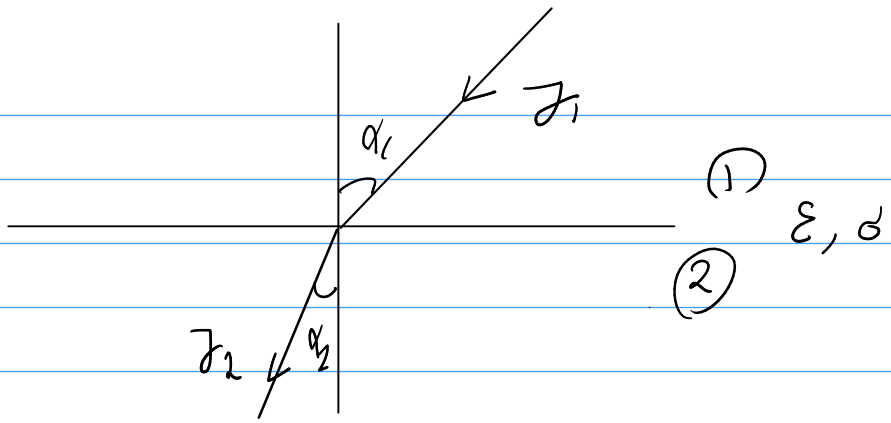
$$= \frac{l_0}{\sigma_a \pi a^2 + \sigma_b \pi (b^2 - a^2)}$$

② $R_{abc} = R_{ab} \parallel R_c$

$$\frac{l_0}{\sigma_a \pi a^2 + \sigma_b \pi (b^2 - a^2)} \parallel \frac{l_0}{\sigma_c \pi (c^2 - b^2)}$$

③ $I_a = \frac{V_0}{R_a}$, $I_b = \frac{V_0}{R_b}$, $I_c = \frac{V_0}{R_c}$

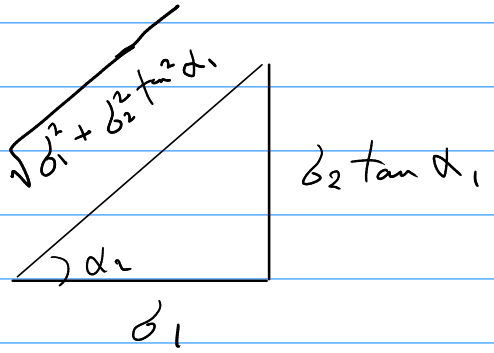
Ex:



$$J_{1N} = J_{2N} \qquad \frac{J_{1T}}{\sigma_1} = \frac{J_{2T}}{\sigma_2}$$

$$J_1 \cos\alpha_1 = J_2 \cos\alpha_2 \qquad \frac{J_1 \sin\alpha_1}{\sigma_1} = \frac{J_2 \sin\alpha_2}{\sigma_2}$$

$$\Rightarrow \frac{\tan\alpha_1}{\sigma_1} = \frac{\tan\alpha_2}{\sigma_2} \Rightarrow \boxed{\alpha_2 = \tan^{-1}\left(\tan\alpha_1 \frac{\sigma_2}{\sigma_1}\right)}$$



$$\boxed{J_2 = J_1 \frac{\sqrt{\sigma_1^2 + \sigma_2^2 \tan^2\alpha_1}}{\sigma_1} \cos\alpha_1}$$

Ch 8

$$\vec{\nabla} \times \vec{B} = \mu \vec{J}$$

$$\oint_C \vec{B} \cdot d\vec{l} = \mu I_{enc}$$