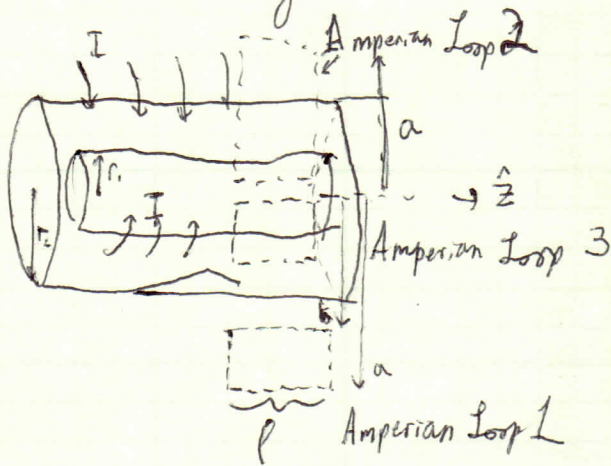


5.16



Loop 1: $I_{enc} = 0$, so

$$\oint_c \vec{B} \cdot d\vec{l} = B(a) - B(b) = 0 \Rightarrow B(a) = B(b), \text{ and we require}$$

$\lim_{S \rightarrow \infty} \vec{B} = 0$ so, since the field is uniform outside the

solenoid, it must be 0 everywhere.

Loop 2:

$$\oint_c \vec{B} \cdot d\vec{l} = Bl \quad I_{enc} = n(I - I) = 0$$

$$\Rightarrow B = 0$$

Loop 3: $\oint_c \vec{B} \cdot d\vec{l} = Bl \quad I_{enc} = -nI$

$$\Rightarrow B = -\mu_0 n I$$

$$\vec{B} = \begin{cases} -\mu_0 n I \hat{z} & \text{between solenoids, i.e. } r_1 < s < r_2 \\ 0 & \text{elsewhere} \end{cases}$$