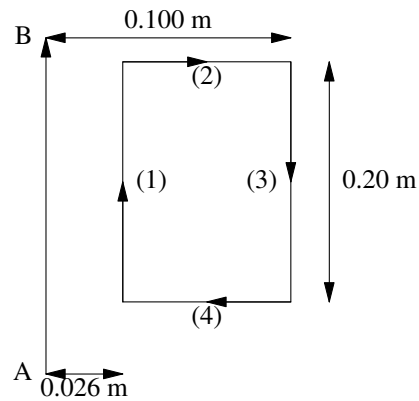
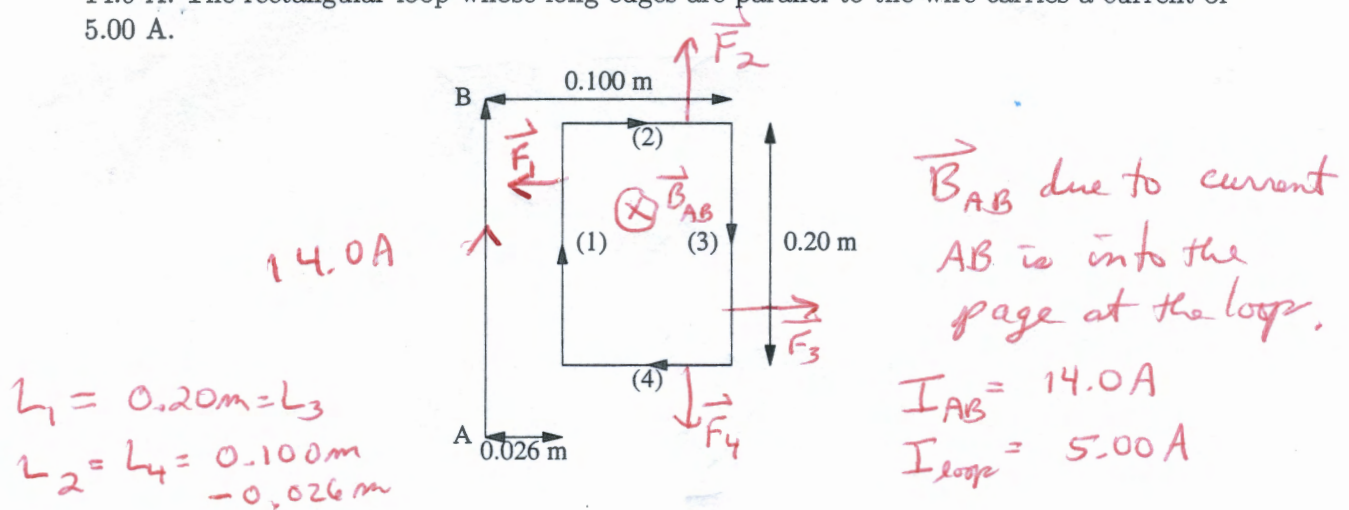


Problem 2: (30 pts.) The long, straight wire AB shown in the figure carries a current of 14.0 A. The rectangular loop whose long edges are parallel to the wire carries a current of 5.00 A.



- (10 pts.) Find the magnitude and direction of the force on segment (1) of the loop.
- (10 pts.) Find the magnitude and direction of the force on segment (2) of the loop.
- (5 pts.) Find the magnitude and direction of the force on segment (3) of the loop. You may simply re-use earlier parts of this problem, if appropriate.
- (5 pts.) Find the magnitude and direction of the force on segment (4) of the loop. You may simply re-use earlier parts of this problem, if appropriate.

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$$a) \vec{F}_1 = I_{\text{loop}} B_{AB} L_1 (-\hat{x}) = (5.00) \left(\frac{\mu_0 I_{AB}}{2\pi (0.026)} \right) (0.20) (-\hat{x}) = \boxed{-1.077 \times 10^{-4} \text{ N } \hat{x}}$$

$$b) \vec{F}_2 = \int_{0.026}^{0.100} I_{\text{loop}} (\hat{x} dx) \frac{\mu_0 I_{AB}}{2\pi x} \times (-\hat{k}) = \frac{\mu_0 I_{AB} I_{\text{loop}}}{2\pi} \ln\left(\frac{0.100}{0.026}\right) \hat{y} = \boxed{1.886 \times 10^{-5} \text{ N } \hat{y}}$$

$$c) \vec{F}_3 = I_{\text{loop}} B_{AB} L_3 \hat{x} = (5.00) \frac{\mu_0 I_{AB}}{2\pi (0.100)} (0.20) \hat{x} = \boxed{2.80 \times 10^{-5} \text{ N } \hat{x}}$$

$$d) \text{ Same as } \vec{F}_2, \text{ except down } \boxed{\vec{F}_4 = -1.886 \times 10^{-5} \text{ N } \hat{y}}$$