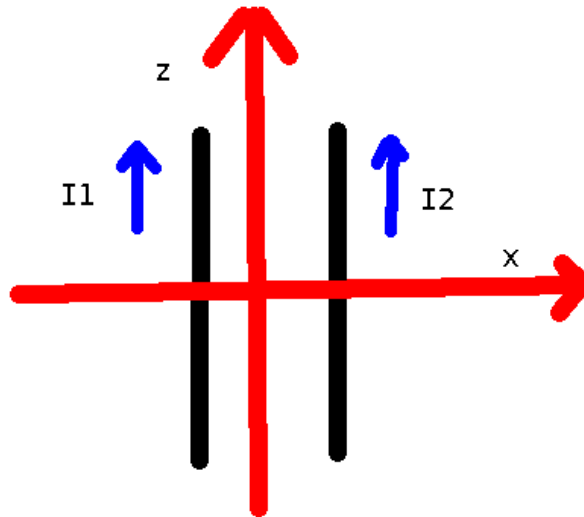


Physics 220: Unquiz 06

Two wires, each of length L carry currents I_1 and I_2 in the $+z$ direction. If the wires are a distance w apart, find the magnitude and direction of the force between the wires. You may assume the wires are in the x - z plane only. Do this by the following:

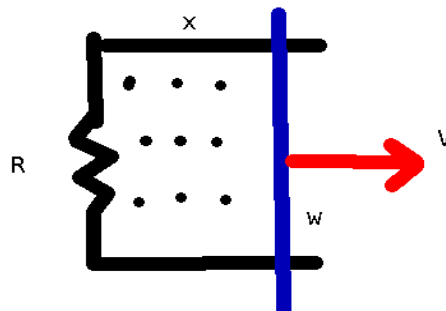
- (a) Calculate the magnetic field at wire 2 from wire 1.
- (b) then find the direction of the force on wire 2.
- (c) then find the magnitude of the force on wire 2.



A bar of width w is on conducting rails with a resistance R . A magnetic field B is directed outward as shown. The bar has an instantaneous position given by:

$$x = x_0 + vt$$

- (a) does the induced current circulate clockwise or counterclockwise?
- (b) Find the magnitude of the induced emf
- (c) find the magnitude of the induced current.



B at 2 from 1:

$$\sum_{\Delta S_i} \vec{B} \cdot d\vec{S}_i = \mu_0 I_c \Rightarrow B(2\pi w) = \mu_0 I_1 \Rightarrow B_{\text{at 2 from 1}} = \frac{\mu_0 I_1}{2\pi w} : \vec{B} = |\vec{B}| \hat{y}$$

$$\vec{F} = I_2 \vec{L} \times \vec{B} = \frac{-I_2 L \mu_0 I_1}{2\pi w} \hat{x}$$

clockwise

$$\text{emf} = \frac{-\Delta \Phi_M}{\Delta t} = -BW \frac{\Delta x}{\Delta t} = -BVW$$

$$\text{emf} = IR \Rightarrow I = \frac{Bwv}{R}$$