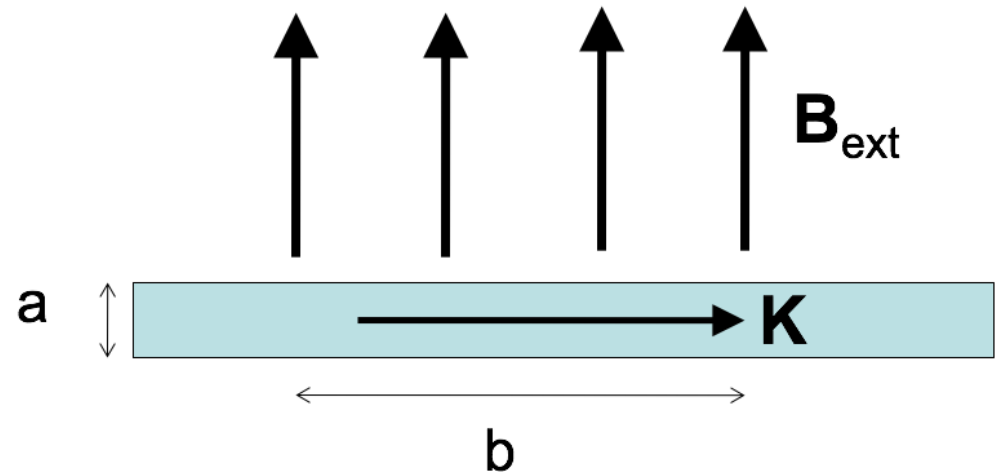


A "ribbon" (width  $a$ ) with uniform surface current density  $K$  passes through a uniform magnetic field  $\mathbf{B}_{ext}$ . Only the length  $b$  along the ribbon is in the field. What is the magnitude of the force on the ribbon?

- A.  $KB$
- B.  $aKB$
- C.  $abKB$
- D.  $bKB/a$
- E.  $KB/(ab)$

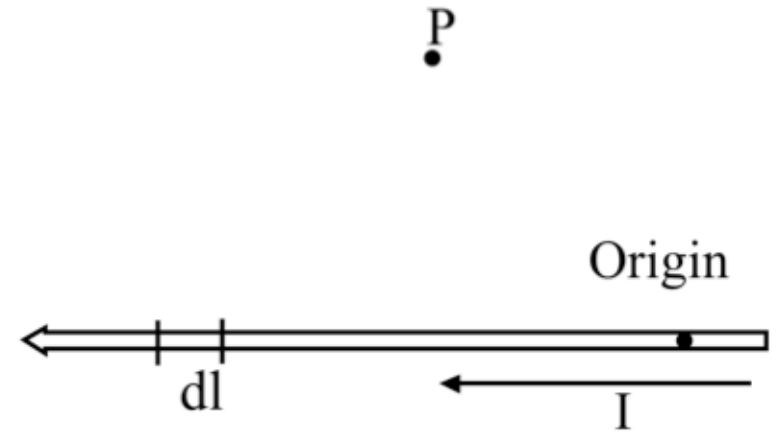


# ANOUNCEMENTS

- No exam grades yet...sorry :(
  - By Friday...promise.
- Homework 12 is due AFTER Thanksgiving break
  - No homework due Wed. before Thanksgiving
  - But, Homework 12 is about 1.5 times longer...

To find the magnetic field  $\mathbf{B}$  at P due to a current-carrying wire we use the Biot-Savart law,

$$\mathbf{B}(\mathbf{r}) = \frac{\mu_0}{4\pi} I \int \frac{d\mathbf{l} \times \hat{\mathbf{R}}}{R^2}$$



What is the direction of the infinitesimal contribution  $\mathbf{B}(P)$  created by current in  $d\mathbf{l}$ ?

- A. Up the page
- B. Directly away from  $d\mathbf{l}$  (in the plane of the page)
- C. Into the page
- D. Out of the page
- E. Some other direction

What is the magnitude of  $\frac{d\mathbf{l} \times \hat{\mathbf{R}}}{R^2}$ ?

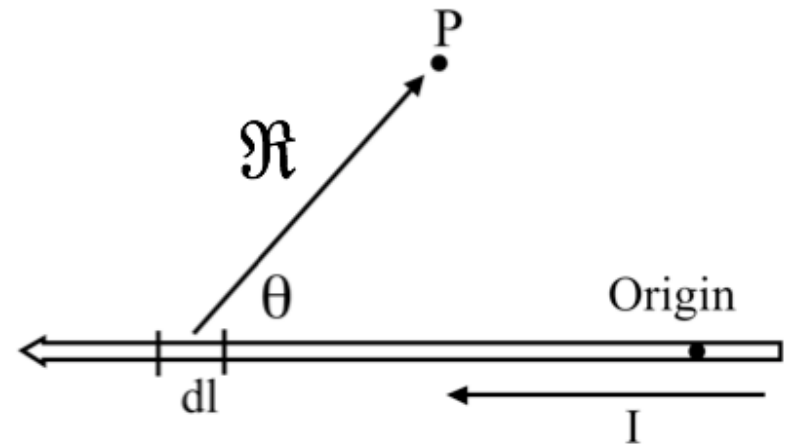
A.  $\frac{dl \sin \theta}{R^2}$

B.  $\frac{dl \sin \theta}{R^3}$

C.  $\frac{dl \cos \theta}{R^2}$

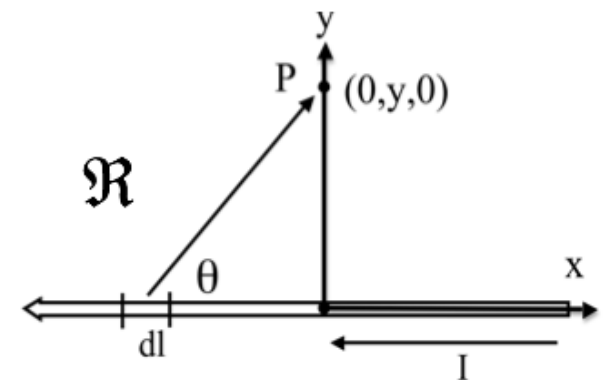
D.  $\frac{dl \cos \theta}{R^3}$

E. something else!

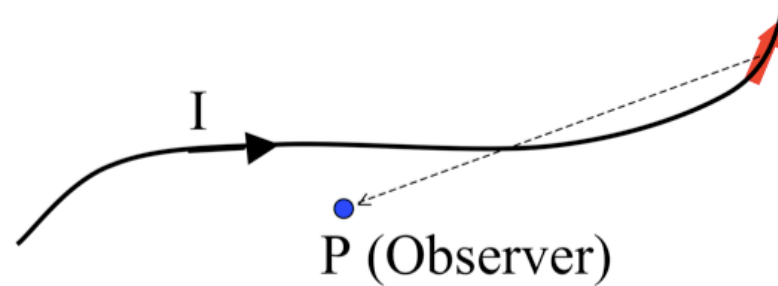


What is the value of  $I \frac{d\mathbf{l} \times \hat{\mathcal{R}}}{\mathcal{R}^2}$ ?

- A.  $\frac{I y dx'}{[(x')^2 + y^2]^{3/2}} \hat{z}$
- B.  $\frac{I x' dx'}{[(x')^2 + y^2]^{3/2}} \hat{y}$
- C.  $\frac{-I x' dx'}{[(x')^2 + y^2]^{3/2}} \hat{y}$
- D.  $\frac{-I y dx'}{[(x')^2 + y^2]^{3/2}} \hat{z}$
- E. Other!



What do you expect for direction of  $\mathbf{B}(P)$ ? How about direction of  $d\mathbf{B}(P)$  generated JUST by the segment of current  $d\mathbf{l}$  in red?



- A.  $\mathbf{B}(P)$  in plane of page, ditto for  $d\mathbf{B}(P$ , by red)
- B.  $\mathbf{B}(P)$  into page,  $d\mathbf{B}(P$ , by red) into page
- C.  $\mathbf{B}(P)$  into page,  $d\mathbf{B}(P$ , by red) out of page
- D.  $\mathbf{B}(P)$  complicated, ditto for  $d\mathbf{B}(P$ , by red)
- E. Something else!!

What is the magnitude of  $\frac{d\mathbf{l} \times \hat{\mathbf{R}}}{R^2}$ ?

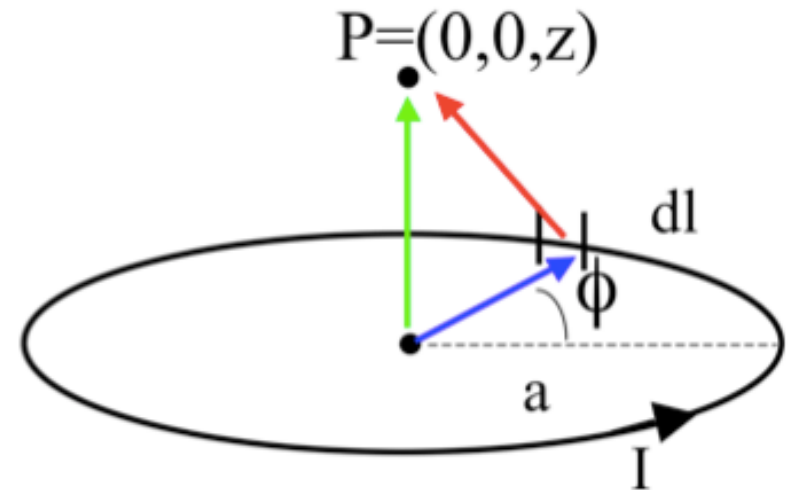
A.  $\frac{dl \sin \phi}{z^2}$

B.  $\frac{dl}{z^2}$

C.  $\frac{dl \sin \phi}{z^2 + a^2}$

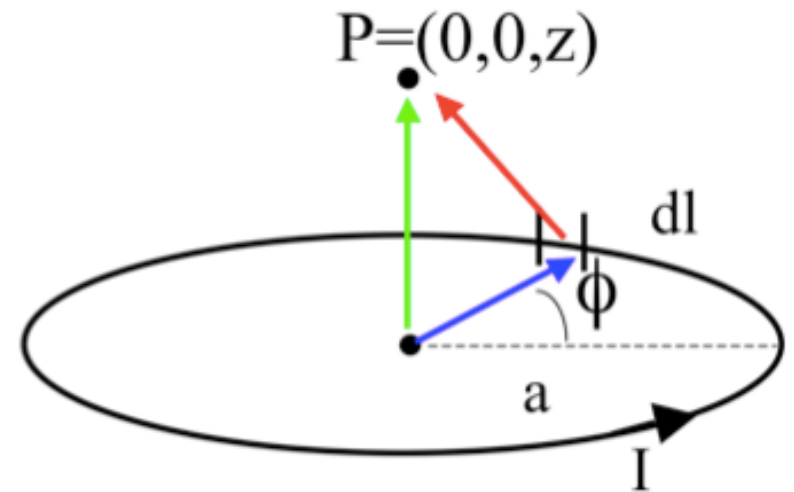
D.  $\frac{dl}{z^2 + a^2}$

E. something else!



What is  $d\mathbf{B}_z$  (the contribution to the vertical component of  $\mathbf{B}$  from this  $d\mathbf{l}$  segment?)

- A.  $\frac{dl}{z^2+a^2} \frac{a}{\sqrt{z^2+a^2}}$
- B.  $\frac{dl}{z^2+a^2}$
- C.  $\frac{dl}{z^2+a^2} \frac{z}{\sqrt{z^2+a^2}}$
- D.  $\frac{dl \cos \phi}{\sqrt{z^2+a^2}}$
- E. Something else!





I have two very long, parallel wires each carrying a current  $I_1$  and  $I_2$ , respectively. In which direction is the force on the wire with the current  $I_2$ ?

- A. Up
- B. Down
- C. Right
- D. Left
- E. Into or out of the page

