Announcements

- Homework 8 due on Monday!
- I'm still working on grade reports (sorry)
- Physics Open House today at 3pm!
    - Be social (I know. . .) and recruit more physics majors!
- Read 5.3 for Monday

Q1

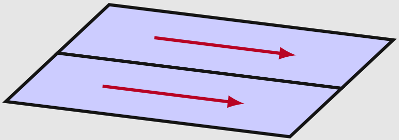
A "ribbon" (width a) of surface current flows with surface current density $\vec{\mathbf{K}}$. Right next to it is a second identical ribbon of current. Viewed collectively, what is the new total surface current density?

A. 0

B. $2\vec{\mathbf{K}}$

C. $\vec{\mathbf{K}}/2$

D. Something else



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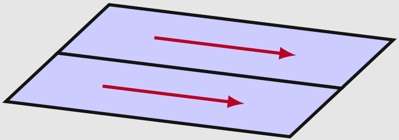
B. $2\vec{\mathbf{K}}$

C. $\vec{\mathbf{K}}/2$

D. Something else ($\vec{\mathbf{K}}$)



Q2

Which of the following is a statement of charge conservation?

A. $\dfrac{\partial \rho}{\partial t} = -\oint \vec{\mathbf{J}} \cdot d\vec{\mathbf{A}}$

B. $-\dfrac{\partial Q}{\partial t} = \oint \vec{\mathbf{J}} \cdot d\vec{\mathbf{A}}$

C. $\dfrac{\partial \rho}{\partial t} = -\boldsymbol{\nabla}\vec{\mathbf{J}}$

D. $\dfrac{\partial Q}{\partial t} = \int \boldsymbol{\nabla} \cdot \vec{\mathbf{J}}\, d\tau$

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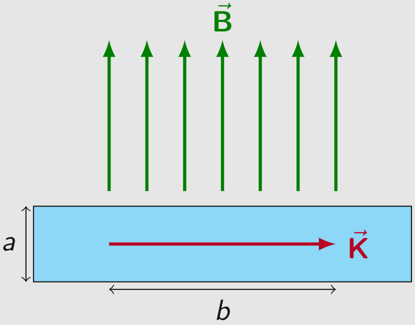
Biot-Savart: Annoying to do and spell

Q3

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



A. $\dfrac{bKB}{a}$

B. aKB

C. $abKB$

D. $\dfrac{KB}{ab}$

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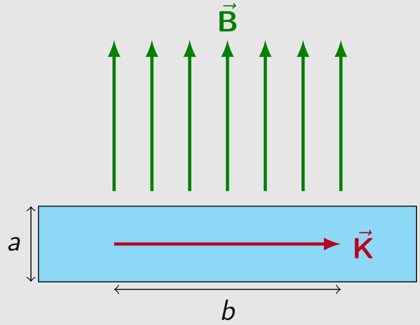

A. $\dfrac{bKB}{a}$
B. aKB
C. $abKB$
D. $\dfrac{KB}{ab}$

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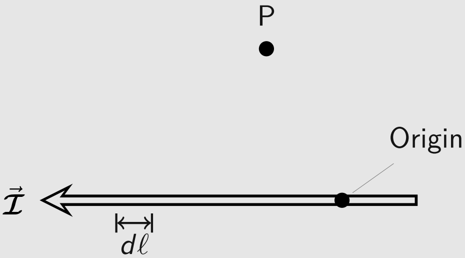
Q4

What is the direction of the infinitesimal contribution $d\vec{\mathbf{B}}$ at point P created by current in $d\vec{\ell}$?

A. Up
B. Up and to the right
C. Into the page
D. Out of the page



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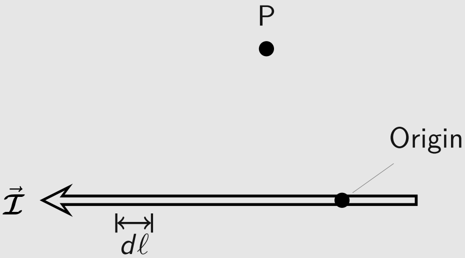

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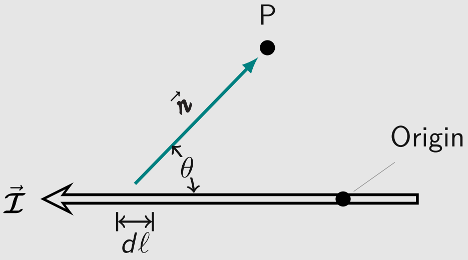
Q5

What is the magnitude of $\frac{d\vec{\ell} \times \hat{\mathscr{r}}}{\mathscr{r}^2}$?



A. $\frac{d\ell \sin\theta}{\mathscr{r}^2}$

B. $\frac{d\ell \sin\theta}{\mathscr{r}^3}$

C. $\frac{d\ell \cos\theta}{\mathscr{r}^2}$

D. $\frac{d\ell \cos\theta}{\mathscr{r}^3}$

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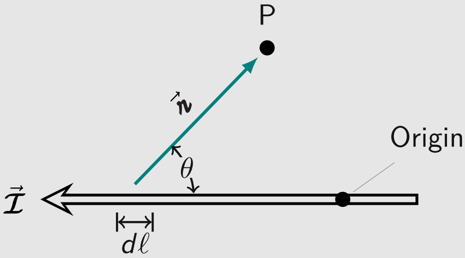


A. $\frac{d\ell \sin\theta}{\mathscr{r}^2}$

B. $\frac{d\ell \sin\theta}{\mathscr{r}^3}$

C. $\frac{d\ell \cos\theta}{\mathscr{r}^2}$

D. $\frac{d\ell \cos\theta}{\mathscr{r}^3}$

Q6

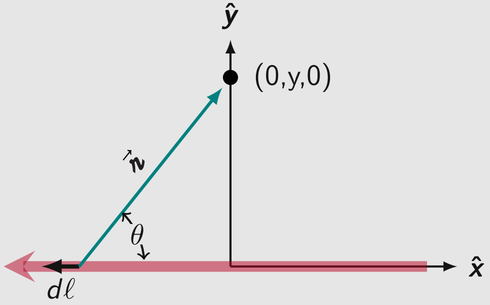
What is the value of $\mathcal{I}\dfrac{d\vec{\ell} \times \hat{\boldsymbol{\mathscr{r}}}}{\mathscr{r}^2}$?

A. $\dfrac{\mathcal{I} y dx_s}{(x_s^2 + y^2)^{3/2}}\hat{\boldsymbol{z}}$

B. $\dfrac{\mathcal{I} x_s dx_s}{(x_s^2 + y^2)^{3/2}}\hat{\boldsymbol{y}}$

C. $\dfrac{-\mathcal{I} x_s dx_s}{(x_s^2 + y^2)^{3/2}}\hat{\boldsymbol{y}}$

D. $\dfrac{-\mathcal{I} y dx_s}{(x_s^2 + y^2)^{3/2}}\hat{\boldsymbol{z}}$



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B. $\dfrac{\mathcal{I} x_s dx_s}{(x_s^2 + y^2)^{3/2}}\hat{\boldsymbol{y}}$

C. $\dfrac{-\mathcal{I} x_s dx_s}{(x_s^2 + y^2)^{3/2}}\hat{\boldsymbol{y}}$

D. $\dfrac{-\mathcal{I} y dx_s}{(x_s^2 + y^2)^{3/2}}\hat{\boldsymbol{z}}$