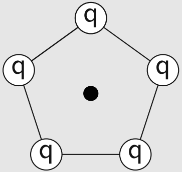
Announcements

- Homework 2
  - Posted yesterday, due Monday night
  - For extra notebook work, please save as a pdf and then combine with your handwritten work for a single pdf to submit
    - Can use online sites like `https://combinepdf.com/` if you need
- If you are late on HW1, just remember you have 14 cumulative grace days!
- Friday: Bring your computers again for visualization day!

I'd say I spent ______ hours on HW1.

A. 1-3 hours
B. 3-6 hours
C. 6-9 hours
D. 9+ hours

5 charges q are arranged in a regular pentagon as shown. What is the electric field at the center?



A. Zero, and I can show it mathematically
B. Zero, but I'm less confident with the math
C. Nonzero, and I can show it mathematically
D. Nonzero, but I'm less confident with the math

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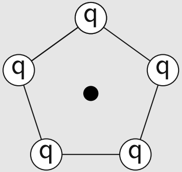

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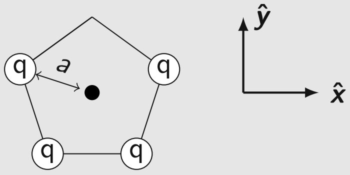
Suppose now we removed the topmost charge. Now what is the electric field at the center of the pentagon?



A. $\frac{4}{4\pi\epsilon_0}\frac{q}{a^2}\hat{\boldsymbol{y}}$

B. $\frac{1}{4\pi\epsilon_0}\frac{q}{a^2}\hat{\boldsymbol{y}}$

C. $-\frac{1}{4\pi\epsilon_0}\frac{q}{a^2}\hat{\boldsymbol{y}}$

D. I need longer to work out this math

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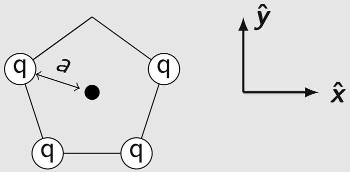

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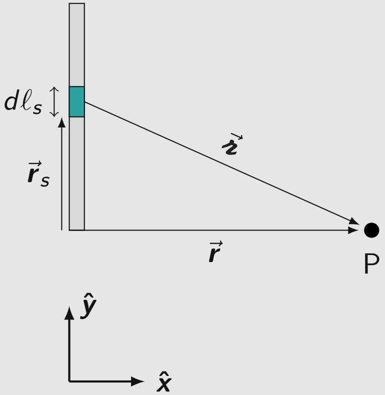
Say we want to find the electric field at point P due to the line of charge to the left. Breaking it up into chunks of length $d\ell$, what is the value of $\mathscr{r}$?



A. x

B. y_s

C. $\sqrt{d\ell_s^2 + x^2}$

D. $\sqrt{x^2 + y_s^2}$

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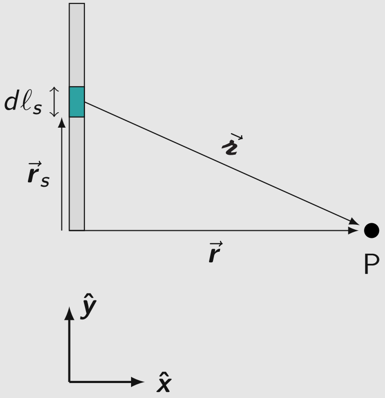

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Given that, in terms of $\vec{\boldsymbol{\mathscr{r}}}$,

$$\vec{\mathbf{E}}(\vec{\boldsymbol{r}}) = \int \frac{\lambda d\ell_s}{4\pi\epsilon_0 \mathscr{r}^3}\vec{\boldsymbol{\mathscr{r}}}$$

what is $\vec{\mathbf{E}}_x(x,0,0)$ (as a function of x)?

A. $\dfrac{\lambda}{4\pi\epsilon_0}\displaystyle\int \frac{x}{x^3} dy_s$

B. $\dfrac{\lambda}{4\pi\epsilon_0}\displaystyle\int \frac{x}{(x^2+y_s^2)^{3/2}} dy_s$

C. $\dfrac{\lambda}{4\pi\epsilon_0}\displaystyle\int \frac{y_s}{(x^2+y_s^2)^{3/2}} dy_s$

D. Something else

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How would you go about solving this integral, if you didn't have computational assistance?

$$\frac{\lambda}{4\pi\epsilon_0}\int\frac{x}{(x^2+y_s^2)^{3/2}}dy_s$$

A. u substitution
B. Trig substitution
C. Integration by parts
D. Throwing up your hands in despair

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How do people feel about Taylor series for working out limiting behavior?

A. I remember them and am comfortable with them
B. I remember them, but am not particularly comfortable with them
C. I've definitely used them before, but I don't recall how they work
D. I am alarmed. What is a Taylor Series?!

Taylor Series! (playing a hunch here. . .)

- The Taylor series of a function f about some point a is

$$f(a) + \frac{f'(a)}{1!}(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \cdots$$

- Most commonly looking at when a variable is small, so a commonly is 0
- Binomial Approximation (Special Taylor)
    - Rewrite equation into form $(1+x)^\alpha$ where x is small
    - Then $(1+x)^\alpha \approx 1 + \alpha x$

What is the limiting behavior of the function

$$f(x) = \frac{x}{\sqrt{x^2 + a^2}}$$

for huge values of x? (Just focusing on x dependency here, you can ignore any a's floating around)

A. $1 + x$

B. 1

C. $1 - \dfrac{1}{x}$

D. $1 - \dfrac{1}{x^2}$

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So, what do you expect to happen to the field as you get really far from the rod?

$$E_x = \frac{\lambda}{4\pi\epsilon_0} \frac{L}{x\sqrt{x^2 + L^2}}$$

A. E_x will go to 0
B. E_x begins to look like a point charge
C. E_x goes to ∞
D. More than one of these is true

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