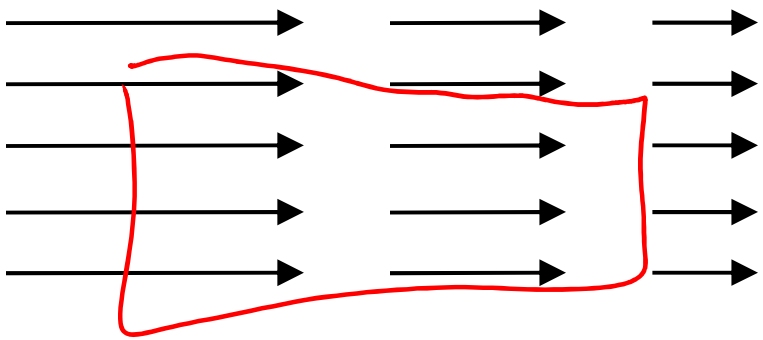
We've looked at how the Helmholtz recipe lets us generate potentials that describe $\vec{E}$ & $\vec{B}$. Let's do it for something new. Let's find potentials that describe $\vec{J}$.

Start by writing down the divergence of and the curl of $\vec{J}$. The latter might take some creative effort; what sorts of things are $\vec{J}$ related to in a straightforward fashion?

Given $\nabla \times \vec{J}$ and $\nabla \cdot \vec{J}$, work through the Helmholtz recipe to find scalar and vector potentials that describe J, and write down the rules for how to get to J from those potentials.

Click in when you're done.

Does this vector field have curl?



$\oint \vec{E} \cdot d\vec{l} =$ thing

$\nabla \times \vec{E} =$ other thing

1

3

A) Yes, everywhere

B) Yes, somewhere

C) No, nowhere

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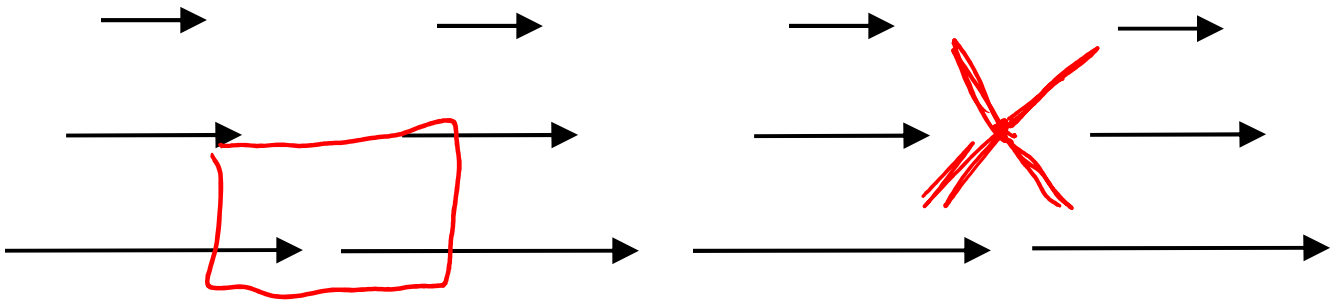
What about this one?



$\oint \vec{E} \cdot d\vec{l}$

A) Yes, everywhere B) Yes, somewhere

C) No, nowhere