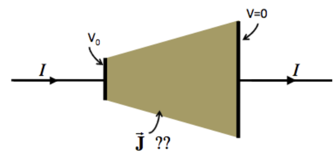
1) A steady current flows through conducting wires that are connected to two metal disks that cap the ends of a cone-shaped resistor (made from a material with uniform conductivity). There is a potential difference V_0 between the two metal end caps.



What can you conclude about the direction of the current density vector (**J**) JUST inside the side wall of the resistor? [for example, the point indicated by the arrow in the diagram above]

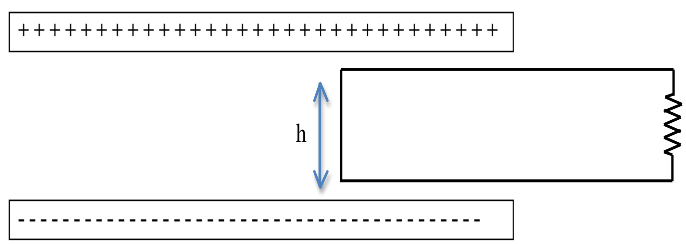
A) Must be exactly parallel with the sides.
B) Must be exactly perpendicular to the sides.
C) Could have a mix of parallel and perpendicular components.
D) No obvious way to decide.

Briefly explain your reasoning.

A rectangular loop of wire is situated so one end (height h) is between the plates of a charged parallel plate capacitor. The other end (with the resistor) is far outside, where the E-field is essentially zero. (See Griffiths Figure 7.9 for a perspective view)

2) What is the SIGN of the EMF around this loop (running clockwise) (+, -, or 0?)

3) If the capacitor plates in the previous question have charge Q (& area A), E between them is given (by Gauss' law) as
$E_0=(1/\varepsilon_0)\ Q/A$.
(Remember how to derive that? If not, review it)
But my question here is:
What is the (approximate) magnitude of current running through the resistor?
(E_0/R, $E_0 h/R$, 0, something else?)



Explain your reasoning

4) Griffiths proves, on Page 296-7, the "Flux rule". If you haven't done so, take a few minutes to really try to make your way through that proof. (Depending on your responses here, I may or may not need to go through the derivation in lecture - but either way, it's worth seeing what you can get out of it just by reading. If you are deeply confused, you can also ask about it in piazza!)

For here, after looking at the proof, just tell me in your own words, what "w", "v" and "u" in that proof represent physically. (If you really understand that, you understand a lot of the proof!)