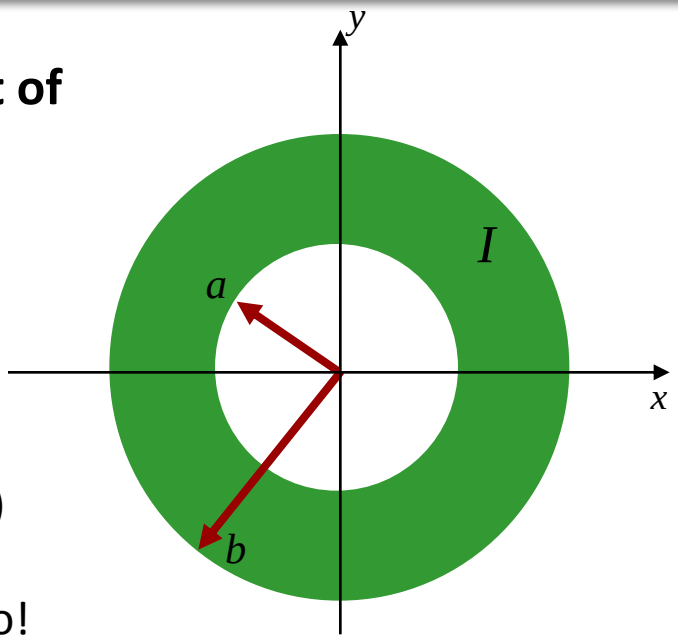
Example Problem

An infinitely long cylindrical shell with inner radius a and outer radius b carries a uniformly distributed current I **out of the screen.**

Sketch $|B|$ as a function of r.



Conceptual Analysis

Complete cylindrical symmetry (can only depend on r)

$\Rightarrow$ can use Ampere's law to calculate B

B field can only be clockwise, counterclockwise or zero!

$$\oint \vec{B} \bullet d\vec{\ell} = \mu_o I_{enc}$$

$$B\oint d\ell = \mu_o I_{enc}$$ For circular path concentric with shell.

Strategic Analysis

Calculate B for the three regions separately:

1) $r < a$
2) $a < r < b$
3) $r > b$