

Special Problem 3-4.1

The current density in a certain region is given by the vector field:

$$\mathbf{J}(\bar{r}) = \frac{-1}{r} \hat{a}_r + \frac{r^2}{\sin\theta} \hat{a}_\theta$$

- a) Find the **time derivative** of the charge density within this region.
- b) By how much does the charge density at point $\bar{r} = \hat{a}_x$ change in 2 seconds ?