An infinitely long cylinder, of radius *R*, carries a "frozen-in" magnetization parallel to the axis,

$$\mathbf{M} = ks^2\hat{\mathbf{z}}$$

where *k* is a constant and *s* is the distance from the axis; there is no free current anywhere.

- Find the magnetic field inside and outside the cylinder by two different methods:
  1- Locate all the bound currents, and then calculate the field they produce.
  2- Use Ampere's law $\oint \mathbf{H} \cdot d\mathbf{l} = I_{fenc}$ to find **H**, and then get **B**.
- Sketch H, M and B/μ_0 as a function of s. Let $k = 1$.