

[lex67] Vector potential of uniformly magnetized sphere

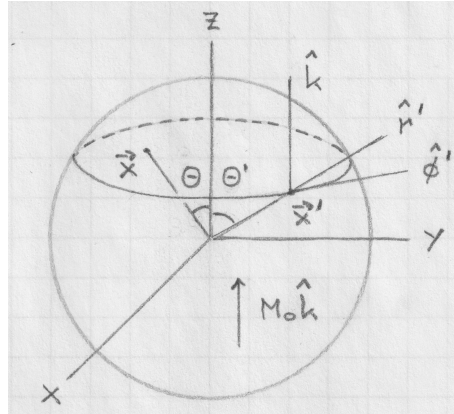
Consider a uniformly magnetized sphere of radius a placed in a coordinate system as shown. The magnetization is

$$\mathbf{M} = M_0 \hat{\mathbf{k}} \quad : \quad |r| \leq a.$$

(a) Show that this is a situation with zero bound current density \mathbf{J}_b in the bulk and nonzero surface bound current density \mathbf{K}_b .

(b) Calculate the vector potential $\mathbf{A}_{\text{int}}(\mathbf{x})$ inside the sphere and the vector potential $\mathbf{A}_{\text{ext}}(\mathbf{x})$ outside starting from the expression

$$\mathbf{A}(\mathbf{x}) = \frac{\mu_0}{4\pi} \oint_S d^2x' \frac{\mathbf{K}_b(\mathbf{x}')}{|\mathbf{x} - \mathbf{x}'|}.$$



Solution: