1. 

(i) Show, keeping explicit track of indices, that

\[
\left. \int d^3x' \bar{x}' \left( \vec{J}(\vec{x}') \cdot \vec{B}(\vec{x}) \right) \right|_{\vec{x}=0} = \left. \left\{ \vec{B}(\vec{x}) \times \int d^3x' \vec{M}(\vec{x}') \right\} \right|_{\vec{x}=0}
\]

(ii) Show that the equation for a magnetic field line due to a magnetic dipole at the origin and oriented along the z-axis is \( r = r_0 \sin^2 \theta \).

(iii) Obtain Jackson’s equation 5.73.