Exercise 1

Show that

\[
\int_0^{2\pi} \int_0^\pi \vec{\delta}_r \sin \theta \, d\theta \, d\phi = 0
\]

\[
\int_0^{2\pi} \int_0^\pi \vec{\delta}_r \cdot \vec{\delta}_r \sin \theta \, d\theta \, d\phi = \frac{4}{3} \pi \delta
\]

where \( \vec{\delta}_r \) is the unit vector in the \( r \) direction in spherical coordinates.