(a) The density of a thin ring may be represented in spherical coordinates as

$$\rho(\vec{r}) = A\,\delta(r - R)\,\delta(\cos\theta)$$

where A is a positive constant and δ is a one-dimensional delta function. This describes a ring of radius R lying in the x-y plane and centered at the origin. By integrating this expression over all space, find the total mass of the ring.

(b) Consider a uniformly charged thin stick of length L lying along the positive z-axis with one endpoint at the origin. Its charge density can be represented in spherical coordinates as

$$\rho(\vec{r}) = \begin{cases} \frac{B}{r^2}\,\delta(\cos\theta - 1) & \text{for} \quad r < L \\ \\ 0 & \text{for} \quad r > L \end{cases}$$

where B is a constant and (again) δ is a one-dimensional delta function. Find the total charge in terms of B and L.