(1) Let $M = S^n \subset \mathbb{R}^{n+1}$ be the unit sphere around 0. Let S_{eq} be the equator in M, i.e $S_{eq} = M \cap (\mathbb{R}^n \times \{0\})$.

Prove that S has measure zero in M.

(2) Let M be the cylinder $\{(x, y, z)|$ such that $x^2+y^2 = 1$ and $0 \leq z \leq 1\}$ in R^3. Let $\omega = zdx$. Fix an orientation on M such that the $e_2 = (0, 1, 0), e_3 = (0, 0, 1)$ give a positive basis of T_pM for $p = (1, 0, 0)$.

Compute $\int_M d\omega$ and $\int_{\partial M} \omega$ and verify that they are equal.

(3) Let M be the solid torus obtained by rotating the disk $(x-2)^2+z^2 \leq 1$ in the xz-plane around the z-axis with the canonical orientation coming from $\mathbb{R}^3$.

Let $\omega = \frac{z}{\sqrt{x^2+y^2}} dx \wedge dy$.

Find $\int_{\partial M} \omega$.

Hint: Use Stokes' Theorem and cylindrical coordinates.