Integrating Differential Forms over Manifolds- HW Problems

1. Let T^2 be the torus embedded in $\mathbb{R}^4$ by

$$\vec{\Phi}(u,v) = (cosu, sinu, cosv, sinv); \quad (u,v) \in [0,2\pi] \times [0,2\pi].$$

Find $\int_{T^2} \omega$ where ω is given by

a. $\omega = x_1^3 dx_1 \wedge dx_4$
b. $\omega = x_1^3 x_3 dx_2 \wedge dx_4$
c. $\omega = x_1 x_4 dx_2 \wedge dx_3$

2. Consider the torus $T^2 \subseteq \mathbb{R}^3$ given by

$$\vec{\Phi}(u,v) = ((3 + cosv)cosu, (3 + cosv)sinu, sinv);$$
where $(u,v) \in [0,2\pi] \times [0,2\pi]$.

Let $\omega = -ydx \wedge dz + xdy \wedge dz$.

Evaluate $\int_{T^2} \omega$.