By using divergence theory compute the surface integral of ∫ ∫T F.ds where T is the unit spehere $x^2+y^2+Z^2=1$. and the vector field F is (y,z,x).

I found the div(F)=0 so the surface integral is zero? Is this correct? Could someone please confirm? Thank you!

Solution.

1. Ostrogradsky-Gauss theorem states that the flow of the vector field $\vec{F}$ through the closed surface T which limits the volume V equals the integral of divergence of the vector field on this volume, namely,

$$\iint_T (\vec{F} * \vec{n}) ds = \iiint_V div\vec{F} dv.$$

2.In the given case $V: x^2 + y^2 + z^2 \leq 1, T: x^2 + y^2 + z^2 = 1, \vec{F} = (y, z, x)$.

3.As $div\vec{F} = 0$ then $\iint_T (\vec{F} * \vec{n}) ds = 0$.