H.W.

① The vector field $x^2\hat{i} + 3\hat{j} + yz\hat{k}$ is defined over the volume of the cuboid given by $0 \leq x \leq a$, $0 \leq y \leq b$, $0 \leq z \leq c$ enclosing the surface S, evaluate $\iint_S \vec{F}.d\vec{S}$.

[Hint: $\vec{F}.d\vec{S} = \vec{F}.\hat{n}\,ds$] Ans.

$$abc\left(a + \frac{b}{2}\right)$$

② Use divergence theorem to evaluate the surface integral $\iint_S \vec{r}.\hat{n}\,ds$ where S is the surface of the sphere $x^2 + y^2 + z^2 = 9$.

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③ Use divergence theorem to evaluate $\iint_S (yz\,dydz + zx\,dzdx + xy\,dxdy)$ where $S: x^2 + y^2 + z^2 = 4$.

[Hint: $\vec{F} = yz\hat{i} + zx\hat{j} + xy\hat{k}$]

Ans. 0

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