Name

QUIZ 7

1. Let $\mathbf{F}(x, y, z) = \langle 2x^2y, 3xy^2, -zxy\rangle$**. What is** $\nabla \cdot F$**?**

$$\nabla \cdot \mathbf{F} = \langle \frac{\delta}{\delta x}, \frac{\delta}{\delta y}, \frac{\delta}{\delta z}\rangle \cdot \langle 2x^2y, 3xy^2, -zxy\rangle =$$

$$\frac{\delta}{\delta x}2x^2y + \frac{\delta}{\delta y}3xy^2 + \frac{\delta}{\delta z} - xyz = 4xy + 6xy - xy = 9xy$$

2. What does your answer to the above [and the appropriate theorem] indicate regarding the relationship of $\iiint_V -3xy \;\; dV$ **and** $\iint_S \langle 2x^2y, 3xy^2, -zxy\rangle \cdot \mathbf{dS}$ **where** V **is the [positively oriented] unit ball and** S **is the [positively oriented] unit sphere?**

Since $9xy = -3(3xy)$ **we should have that**

$$\int\int_{\partial V} \langle 2x^2y, 3xy^2, -zxy\rangle \cdot \mathbf{dS} = -3\int\int\int_V -3xy \;\; dV$$

3. Is there a vector function G such that $\mathbf{F} = \nabla \times G$**? [Where F is the F in the first problem.] Why?**

Since $\nabla \cdot F \neq 0$ **we cannot have G such that** $\mathbf{F} = \nabla \times \mathbf{G}$ **since then we would have** $9xy = \nabla \cdot \mathbf{F} = \nabla \cdot (\nabla \times \mathbf{G}) = 0$**, which is not true in general.**