**Question 1** Suppose $F$ is a $C^1$ vector field on $\mathbb{R}^3$. Let $H$ be the unit hemisphere given by $x^2 + y^2 + z^2 = 1$ with $z \geq 0$, let $D$ be the unit disk given by $z = 0$ with $x^2 + y^2 \leq 1$, and let $S = H \cup D$. Then,

A. $\partial H = \partial D$, including orientation when $H$ and $D$ are both oriented with the upward-pointing unit normal vector.

B. $\int \int_H (\nabla \times F) \cdot dS = \int \int_D (\nabla \times F) \cdot dS$.

C. $\int \int_S (\nabla \times F) \cdot dS = \int \int_H (\nabla \times F) \cdot dS + \int \int_D (\nabla \times F) \cdot dS$.

D. $\int \int_S (\nabla \times F) \cdot dS = 0$.

*E. A, B and D*
**Question 2** Suppose $\mathbf{F}$ is a $C^2$ vector field on $\mathbb{R}^3$, and let $S$ be the unit sphere given by $x^2 + y^2 + z^2 = 1$. Then, \[ \int\int_S (\nabla \times \mathbf{F}) \cdot dS \]

**A.** by Stokes’ Theorem is equal to $\int_{\partial S} \mathbf{F} \cdot ds$.

**B.** by Gauss’s Theorem is equal to $\int\int\int_B \nabla \cdot (\nabla \times \mathbf{F}) \, dV$, where $B$ is the unit ball given by $x^2 + y^2 + z^2 \leq 1$.

**C.** is 0.

**D.** A and B

**E.** A, B, and C