Math 20E

August 25, 2014

Question 1 Given a C^1 surface with two distinct parametrizations $\Phi : D \to S$ and $\Psi : D \to S$, and given $f(x, y, z)$ a continuous function defined on S. Then,

***A.** $\iint_{\Phi} f \, dS = \iint_{\Psi} f \, dS$

B. $\iint_{\Phi} f \, dS < \iint_{\Psi} f \, dS$ when $||\frac{\partial \Phi}{\partial u} \times \frac{\partial \Phi}{\partial v}|| < ||\frac{\partial \Psi}{\partial u} \times \frac{\partial \Psi}{\partial v}||$

C. $\iint_{\Phi} f \, dS = -\iint_{\Psi} f \, dS$ when $\frac{\partial \Phi}{\partial u} \times \frac{\partial \Phi}{\partial v} = -\left(\frac{\partial \Psi}{\partial u} \times \frac{\partial \Psi}{\partial v}\right)$

D. **B** and **C**

E. none of the above

Question 2 Given a C^1 surface S parameterized by $\Phi : D \to S$, where

$$\Phi(u,v) = (x\,(u,v)\,,\, y\,(u,v))\,,\, z\,(u,v))\,,$$

and given $\mathbf{F}(x,y,z)$ a continuous vector field defined on S. Then,

A. $\displaystyle\iint_S \mathbf{F}\cdot d\mathbf{S} = \iint_D \mathbf{F}\left(\Phi\left(u,v\right)\right)\cdot\left(\mathbf{T}_u \times \mathbf{T}_v\right)\, du\, dv$

B. $\displaystyle\iint_S \mathbf{F}\cdot d\mathbf{S} = -\iint_D \mathbf{F}\left(\Phi\left(u,v\right)\right)\cdot\left(\mathbf{T}_v \times \mathbf{T}_u\right)\, dv\, du$

C. The average value of $\mathbf{F}$ on S is $\displaystyle\frac{1}{A(S)}\iint_S \mathbf{F}\cdot d\mathbf{S}$, where

$$A(S) = \iint_D ||\mathbf{T}_u \times \mathbf{T}_v||\, du\, dv$$

*__D.__ **A** and **B**

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

Question 3 Given a C^1 surface with two distinct parametrizations $\Phi : D \to S$ and $\Psi : D \to S$, and given $\mathbf{F}(x, y, z)$ a continuous vector field defined on S. Then,

A. $\iint_\Phi \mathbf{F} \cdot d\mathbf{S} = \iint_\Psi \mathbf{F} \cdot d\mathbf{S}$

B. $\iint_\Phi \mathbf{F} \cdot d\mathbf{S} = \iint_\Psi \mathbf{F} \cdot d\mathbf{S}$ when $\frac{\frac{\partial \Phi}{\partial u} \times \frac{\partial \Phi}{\partial v}}{||\frac{\partial \Phi}{\partial u} \times \frac{\partial \Phi}{\partial v}||} = \frac{\frac{\partial \Psi}{\partial u} \times \frac{\partial \Psi}{\partial v}}{||\frac{\partial \Psi}{\partial u} \times \frac{\partial \Psi}{\partial v}||}$

C. $\iint_\Phi \mathbf{F} \cdot d\mathbf{S} = -\iint_\Psi \mathbf{F} \cdot d\mathbf{S}$ when $\frac{\frac{\partial \Phi}{\partial u} \times \frac{\partial \Phi}{\partial v}}{||\frac{\partial \Phi}{\partial u} \times \frac{\partial \Phi}{\partial v}||} = -\frac{\frac{\partial \Psi}{\partial u} \times \frac{\partial \Psi}{\partial v}}{||\frac{\partial \Psi}{\partial u} \times \frac{\partial \Psi}{\partial v}||}$

D. $\iint_\Phi \mathbf{F} \cdot d\mathbf{S} < \iint_\Psi \mathbf{F} \cdot d\mathbf{S}$ when $||\frac{\partial \Phi}{\partial u} \times \frac{\partial \Phi}{\partial v}|| < ||\frac{\partial \Psi}{\partial u} \times \frac{\partial \Psi}{\partial v}||$

*__E.__ **B** and **C**