Math 20E

August 10, 2017

Question 1 If $D \subseteq \mathbb{R}^2$ is enclosed by continuous curves $y = \phi_1(x)$ and $y = \phi_2(x)$ with $\phi_1(x) < y < \phi_2(x)$ for $a \le x \le b$, with $c = [\phi_1]_{\text{min}}$ and $d = [\phi_2]_{\text{max}}$, then

A. $\displaystyle\iint_D f(x,y)\,dA = \iint_R f^*(x,y)\,dA$, where

$R = [a,b] \times [c,d]$ and

$$f^*(x,y) = \begin{cases} f(x,y) & \text{if } (x,y) \in D \\ 0 & \text{otherwise} \end{cases}.$$

B. $\displaystyle\iint_D f(x,y)\,dA = \int_{x=a}^{b} \int_{y=\phi_1(x)}^{\phi_2(x)} f(x,y)\,dy\,dx.$

***C.** Both **A** and **B**

D. Neither **A** nor **B**

Question 2 If $D \subseteq \mathbb{R}^2$ is $\mathbf{y}$-**simple**, then

*__A.__ $\displaystyle\iint_D f(x,y)\,dA = \int_{x=a}^{b}\int_{y=\phi_1(x)}^{\phi_2(x)} f(x,y)\,dy\,dx$ for some functions ϕ_1, ϕ_2 and constants a, b.

B. $\displaystyle\iint_D f(x,y)\,dA = \int_{y=c}^{d}\int_{x=\psi_1(y)}^{\psi_2(y)} f(x,y)\,dx\,dy$ for some functions ψ_1, ψ_2 and constants c, d.

C. Both **A** and **B**

D. **A** or **B** (or both)

Question 3 If $D \subseteq \mathbb{R}^2$ is **simple**, then

A. $\displaystyle\iint_D f(x,y)\,dA = \int_{x=a}^{b}\int_{y=\phi_1(x)}^{\phi_2(x)} f(x,y)\,dy\,dx$ for some functions ϕ_1, ϕ_2 and constants a, b.

B. $\displaystyle\iint_D f(x,y)\,dA = \int_{y=c}^{d}\int_{x=\psi_1(y)}^{\psi_2(y)} f(x,y)\,dx\,dy$ for some functions ψ_1, ψ_2 and constants c, d.

C. D is both x-simple and y-simple.

***D. A**, **B** and **C**

E. A or **B** (or both)

Question 4 If $D \subseteq \mathbb{R}^2$ is **elementary**, then

A. $\iint_D f(x,y)\,dA = \int_{x=a}^{b} \int_{y=\phi_1(x)}^{\phi_2(x)} f(x,y)\,dy\,dx$ for some functions ϕ_1, ϕ_2 and constants a, b.

B. $\iint_D f(x,y)\,dA = \int_{y=c}^{d} \int_{x=\psi_1(y)}^{\psi_2(y)} f(x,y)\,dx\,dy$ for some functions ψ_1, ψ_2 and constants c, d.

C. D is both x-simple and y-simple.

D. **A**, **B** and **C**

*__E.__ **A** or **B** (or both)