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 $a \leq x \leq b$, with $c = [\phi_1]_{\min}$ and $d = [\phi_2]_{\max}$, then

A. $\int\int_D f(x,y) \, dA = \int\int_R f^*(x,y) \, dA$, 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. $\int\int_D f(x,y) \, dA = \int_a^b \int_{y=\phi_1(x)}^{\phi_2(x)} f(x,y) \, dy \, dx$.

*C. Both A and B

D. Neither A nor B
Question 2  If $D \subseteq \mathbb{R}^2$ is y-simple, then

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

*B.\  \int_{D} \int f(x, y) \, dA = \int_{y=c}^{d} \int_{x=\psi_1(y)}^{\psi_2(y)} f(x, y) \, dx \, dy$ for some functions $\psi_1, \psi_2$ 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.  $\int\int_D f(x, y) \, dA = \int_{x=a}^{b} \int_{y=\phi_1(x)}^{\phi_2(x)} f(x, y) \, dy \, dx$ for some functions $\phi_1, \phi_2$ and constants $a, b$.

B.  $\int\int_D f(x, y) \, dA = \int_{y=c}^{d} \int_{x=\psi_1(y)}^{\psi_2(y)} f(x, y) \, dx \, dy$ for some functions $\psi_1, \psi_2$ 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. $\int\int_D f(x, y) \, dA = \int_{x=a}^{b} \int_{y=\phi_1(x)}^{\phi_2(x)} f(x, y) \, dy \, dx$ for some functions $\phi_1, \phi_2$ and constants $a, b$.

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

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

D. A, B and C

*E. A or B (or both)