Question 1  A primitive of a continuous function \( f : \mathbb{C} \to \mathbb{C} \) is

A. an antiderivative of \( f \).

B. a function \( F : \mathbb{C} \to \mathbb{C} \) such that \( F'(z) = f(z) \).

C. an exact differential of \( f \).

*D. both A and B."

E. all of the above.
Question 2  A continuous path $\gamma : [a, b] \to \mathbb{C}$ is simple if

A. $\gamma(b) = \gamma(a)$.
B. $\gamma(t_1) \neq \gamma(t_2)$ whenever $t_1 \neq t_2$.
C. the image curve $\gamma([a, b])$ has no self-intersections.

*D. B and C.*

E. all of the above.
Question 3  A continuous path $\gamma : [a, b] \to \mathbb{C}$ is closed if

*A. $\gamma(b) = \gamma(a)$.

B. $\gamma(t_1) \neq \gamma(t_2)$ whenever $t_1 \neq t_2$.

C. the image curve $\gamma([a, b])$ has no self-intersections.

D. B and C.

E. all of the above.
Question 4  Let $\gamma : [a, b] \to \mathbb{C}$ be a piecewise smooth path with length $L$. We can conclude

A. $\left| \int_{\gamma} dz \right| \leq L.$

B. $\int_{\gamma} |dz| = L.$

C. $\int_{a}^{b} |\gamma'(t)| \, dt = L.$

D. B and C; they are the same.

*E. all of the above.
Question 5  Recall that \( \log(z) \) is the principle branch of the logarithm and that \( \log'(z) = \frac{1}{z} \) at all points \( z \in \mathbb{C} \) where this makes sense. Thus,

A. \( \log(z) \) is an antiderivative for \( \frac{1}{z} \) on the slit plane \( \mathbb{C} \setminus (-\infty, 0] \).

B. \( \log(z) \) is a primitive for \( \frac{1}{z} \) on the slit plane \( \mathbb{C} \setminus (-\infty, 0] \).

C. \( \log(z) \) is a primitive for \( \frac{1}{z} \) on the punctured plane \( \mathbb{C} \setminus \{0\} \) since neither \( \log(z) \) nor \( \frac{1}{z} \) are defined at 0.

*D. A and B; they are the same.

E. none of the above; slitting or puncturing planes is vandalism and is not allowed.