

Math 120A
August 17, 2022

Question 1 Let $\gamma : [a, b] \rightarrow \mathbb{C}$ 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 2 A set $D \subset \mathbb{C}$ is a *domain* if

- A. for every $z \in D$ there is $\epsilon > 0$ so that $\{w \in \mathbb{C} \mid |w - z| < \epsilon\} \subset D$.
- B. any two points in D can be connected by a continuous path consisting of a finite number of line segments.
- C. for every pair of points $z_1, z_2 \in D$, the line segment joining them is contained in D .
- *D. **A** and **B**.
- E. all of the above.

Question 3 Let γ be the curve $|z| = 2$ with positive (counterclockwise) orientation. Then the integral $\int_{\gamma} \frac{z^n}{z-3} dz$

- *A. is equal to 0 by Cauchy's theorem.
- B. is equal to 3^n by the Cauchy integral theorem.
- C. is equal to $2\pi i 3^n$ by the Cauchy integral theorem.
- D. is undefined because $\frac{z^n}{z-3}$ is undefined at $z = 3$.
- E. none of the above.

Question 4 Let γ be the curve $|z| = 2$ with positive (counterclockwise) orientation. Then the integral $\int_{\gamma} \frac{z^n}{z-1} dz$

- A. is equal to 0 by Cauchy's theorem.
- B. is equal to 1 by the Cauchy integral theorem.
- *C. is equal to $2\pi i$ by the Cauchy integral theorem.
- D. is undefined because $\frac{z^n}{z-1}$ is undefined at $z = 1$.
- E. none of the above.