

Math 120A
August 18, 2022

Question 1 A function is said to be *smooth* if it

- A. is continuous.
- B. is differentiable.
- C. is continuously differentiable.
- D. has derivatives of all orders (also called “infinitely differentiable”).
- *E. has as many derivatives as necessary for whatever is being asserted to be true.

Question 2 A set $D \subset \mathbb{C}$ is *open* 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 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 4 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 5 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.

Question 6 Let γ be the curve $|z| = 2$ with positive (counterclockwise) orientation. Then the integral $\int_{\gamma} \frac{z^n}{z+2} dz$

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