generalized Cauchy integral formula

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Theorem. *Let $U \subset \mathbb{C}$ be a domain with C^1 boundary. Let $f \colon U \to \mathbb{C}$ be a C^1 function that is C^1 up to the boundary. Then for $z \in U$,*

$$f(z) = \frac{1}{2\pi i} \int_{\partial U} \frac{f(w)}{w-z} dw - \frac{1}{2\pi i} \int_U \frac{\frac{\partial f}{\partial \bar{z}}(w)}{w-z} d\bar{w} \wedge dw.$$

Note that C^1 up to the boundary means that the function and the derivative extend to be continuous functions on the closure of U. The theorem follows from Stokes' theorem. When f is holomorphic, then the second term is zero and this is the classical Cauchy integral formula.

References

[1] Lars Hörmander. , North-Holland Publishing Company, New York, New York, 1973.

[2] Steven G. Krantz. , AMS Chelsea Publishing, Providence, Rhode Island, 1992.