THE MISTAKES BY CAUCHY

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For the zeta function [1] we have

$$A := \int_C dx \frac{x^{s-1}}{e^x - 1}$$

analytic in the whole complex plain, but for $s > 1$

$$A = \int_0^\infty dx \frac{x^{s-1} - (e^{2\pi i} x)^{s-1}}{e^x - 1}$$

for great n

$$|A^{(n)}(s)| > |C' \int_0^1 dx \ln^n x (x^{s-1} - (e^{2\pi i} x)^{s-1})/x| > C|1 - e^{2(s-1)\pi i}|n!/|(s-1)^n|, C > 0.1$$

This means it has convergent radium $|s - 1|$. Use this function we can easily to deny the Cauchy's theorem. The proof mistakes in that: when we try to prove all the integral error close to zero, we should list all the integral limits of partitions in a set, and with indexed elements of each limits, at last we find the proof of limit on indexes is inaccessible. We don't need conformal limits but need conformal proof. A part proof of the zero integration between two circles needs this weakly conformal limit.

References

[1] H. M. Edwards (1974). Riemann's Zeta Function. Academic Press. ISBN 0-486-41740-9.

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