# 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 its convergent radium is less than $|s-1|$. Use this function we can easily to deny the Cauchy's theorem. The proof mistakes in that: we should make double limit of partitions $P_i$ and integral circles $C_i$,

$$\lim_{C_i} \lim_{P_j} A_{ij}, \lim_{P_j} \lim_{C_i} A_{ij}$$

to ensure the sum of the integration and its errors of area between successive circles of the series, which means the limit is

$$\lim_{P_{j(k,i)}} \lim_{C_i} A_{ij}$$

$j$ is function of $k, i$. So that it's conformal double limit.

General quantifier and Universal quantifier, these two words seem the same, but this example

$$\lim_{i\to\infty} \lim_{n\to\infty} a_{in} = C$$

and the following is valid

$$\forall i( \lim_{n(i,k), k\to\infty} a_{in})$$

Universal quantifier means conformal limit:

$$\lim_{k\to\infty} (a_{1,n(1,k)}, a_{2,n(2,k)}, ...)$$

*Proof.* This condition means $|a_{in}| < C'$. Choose $n(k,i)$ to set

$$\lim_{i\to\infty} a_{i,n(i,k)} = C_k$$

We can easily find

$$\lim_{k\to\infty} C_k = C$$

□

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So that, define General Quantifier: any, is denoted by

$$\forall i$$

Universal Quantifier: for all, can be denoted by

$$@i$$

The reason of this situation is that inductive or one-after-one proof can't empty the set of natural number.

## References

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

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