On the differentiability of Weierstrass- Zygmund series and the value distribution of harmonic gradients

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ABSTRACT:

The borderline examples in Weierstrass construction of continous, nowhere differentiable functions belong to the so called Zygmund class.

In the case of a single variable, Rajchman and Zygmund pointed out that a nowhere differentiable Zygmund function still exhibits some nice differentiability properties, in the sense that there are many points where the divided differences are bounded. The sharpest result was obtained by Makarov in the 80's.

In the talk we will consider the higher- dimensional analogue of the problem, with special emphasis to the case of Zygmund functions given by Weierstrass-type series.

We will remind the connection between the divided differences of a Zygmund function and the boundary properties of the gradient of its harmonic extension in the upper half -space. A certain "uniform exit distribution" of the gradient and its expression in the case of Weierstrass series play a key role in the method. (Joint work with J. Donaire and A. Nicolau).