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Subdifferential Analysis of the Van der Waerden Function

A concise and direct proof is given that Hölder subdifferentials of the (continuous but nowhere differentiable) Van der Waerden function $H(\cdot)$ exhibits the same behaviour as the Weierstrass function: There exists a countable dense set $\Gamma \subset R$ (the dyadic rationals) such that each Hölder subdifferential $\partial_\alpha H(x)$ is all of $\mathbb{R}$ for every $x \in \Gamma$, while $\partial_\alpha H(x) = \emptyset$ for $x \notin \Gamma$.

Keywords: Van der Waerden function, Hölder subdifferentials, nonsmooth analysis.

MSC: 26A27, 49J52