

Proof of a conjecture by Wolke and related
properties of the divisor function

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Abstract

Dieter Wolke proved in 1977 that for every $a \geq 1$ and every $\varepsilon > 0$, the inequality $|\sigma(n)/n - a| < n^{(\varepsilon - 2/5)}$, where $\sigma(n)$ is the divisor function, has infinitely many solutions in natural numbers. He conjectured that the exponent $2/5$ could be replaced by 1. Via an investigation of certain sequences of values of the divisor function, we discover an organization to the ranges of both $\sigma(n)$ and $\sigma(n)/n$ and are able to verify Wolke's conjecture.