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The gamma function inequalities of Gurland and Gautschi

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Abstract

The two majorants in question are Gurland's Inequality [1]

$$\frac{\Gamma^2(\delta + \alpha)}{\Gamma(\delta) \Gamma(\delta + 2\alpha)} \leq \frac{\delta}{\delta + \alpha^2} \quad \alpha + \delta > 0, \alpha \neq 0, 1, \delta > 0, \quad (1)$$

and Gautschi's Inequality [2]

$$\frac{\Gamma(n + s)}{\Gamma(n + 1)} \geq (n + 1)^{s-1} \quad n = 1, 2, \dots, 0 \leq s \leq 1. \quad (2)$$

By combining these

inequalities it is possible to improve iteratively upon Gautschi's result (2) and also to develop upper bounds for $\Gamma(n+2)/\Gamma(n+2^2)$, $n = 1, 2, \dots, 0 < 2 < 1$.

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