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The gamma function inequalities of Gurland and Gautschi

Thomas Erber

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Abstract

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

$$egin{aligned} rac{\Gamma^2 \left(\delta + lpha
ight)}{\Gamma \left(\delta
ight) \Gamma \left(\delta + 2\,lpha
ight)} \leqslant & rac{\delta}{\delta + lpha^2} & lpha + \delta > 0, \;\; lpha
eq 0, \; 1, \;\; \delta > 0, \ & rac{\Gamma \left(n + s
ight)}{\Gamma \left(n + 1
ight)} \geqslant (n + 1)^{s - 1} & n = 1, \; 2, \; \dots, \;\; 0 \leqslant s \leqslant 1. \end{aligned}$$

$$\alpha+\delta>0$$
, $\alpha\neq0$, 1 , $\delta>0$,

and Gautschi's Inequality [2]

$$\frac{\Gamma\left(n+s\right)}{\Gamma\left(n+1\right)}\geqslant (n+1)^{s-1}$$

$$n = 1, 2, \ldots, 0 \leq s \leq 1.$$

By combining these

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

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A. V. Boyd

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