Year: 2012 | **Vol.: 80** | **Fasc.: 3-4**

Title: Fractional part integral representation for derivatives of a function related to $\ln\Gamma(x+1)$

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For $0 \neq x > -1$ let

$$\Delta(x) = \frac{\ln\Gamma(x+1)}{x}.$$

Recently Adell and Alzer proved the complete monotonicity of Δ' on $(-1,\infty)$ by giving an integral representation of $(-1)^n\Delta^{(n+1)}(x)$ in terms of the Hurwitz zeta function $\zeta(s,a)$. We reprove this integral representation in different ways, and then re-express it in terms of fractional part integrals. Special cases then have explicit evaluations. Other relations for $\Delta^{(n+1)}(x)$ are presented, including its leading asymptotic form as $x \to \infty$.

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