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On a generalization of Euler constant in connection to di-Gamma function

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ABSTRACT.

In this paper we study the sequences $\{x_n\}$, $\{y_n\}$ defined for each $n \geq 1$ by

$$x_n = \frac{1}{a} + \frac{1}{a+1} + \cdots + \frac{1}{a+n-1} - \ln\left(\frac{a+n}{a} + b\right), \tag{0.1}$$

and

$$y_n = \frac{1}{a} + \frac{1}{a+1} + \cdots + \frac{1}{a+n-1} - \ln\left(\frac{a+n-1}{a} + b\right), \tag{0.2}$$

where $a \in (0, +\infty)$ and $b \in \left[0, \frac{1}{2a}\right]$, in connection to Gamma and di-Gamma function.

Our results generalize some previous ones in [Berinde, V. *A new generalization of Euler's constant*, Creat. Math.Inform. **18** (2009), No. 2, 123–128] and [Sântămărian, A., *A generalization of Euler constant*, Mediamira, Cluj-Napoca, 2008] and are inspired from the paper [Mortici, C., *Improved convergence towards generalized Euler-Mascheroni constant*, Appl. Math. Comput., 2009, doi: 10.1016/j.amc.2009.10.039].

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