Journal of Classical Analysis
Volume 13, Number 2 (2018), 123–131
doi:10.7153/jca-2018-13-08

ON k–ANALOGUES OF DIGAMMA AND POLYGAMMA FUNCTIONS

EMRAH YILDIRIM AND İNCI EGE

Abstract. In this work, we obtain some integral representations of k-analogue of classical digamma function $\psi(x)$. Then by using the concepts of neutrix and neutrix limit, we generalize the k-digamma function $\psi_k(x)$ and the k-polygamma function $\psi_k^{(r)}(x)$ for all real values of x, $r \in \mathbb{N}$ and $k > 0$. Also further results are given.

Mathematics subject classification (2010): 33B15, 33B99.
Keywords and phrases: Digamma function, polygamma function, k-digamma function, k-polygamma function, neutrix.

REFERENCES

[1] M. ABRAMOWITZ AND I. A. STEGUN (Eds), *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*, National Bureau of Standards, Applied Mathematics Series **55**, Washington, 1970.
[2] J. G. VAN DER CORPUT, *Introduction to the neutrix calculus*, Journal d'Analyse Mathématique **7**, 1 (1959), 281–398.
[3] R. DIAZ AND E. PARIGUAN, *On hypergeometric functions and Pochhammer k-symbol*, Divulgaciones Matemáticas **15**, 2 (2007), 179–192.
[4] İ. EGE AND E. YILDIRIM, *Some generalized equalities for the q-gamma function*, Filomat **26**, 6 (2012), 1227–1232.
[5] B. FISHER AND Y. KURIBAYASHI, *Neutrices and the gamma function*, J. Fac. Ed. Tottori Univ. Math. Sci. **36**, 1-2 (1987), 1–7.
[6] B. FISHER AND Y. KURIBAYASHI, *Some results on the gamma function*, The Journal of Faculty of Education Tottori University **37**, 2 (1988).
[7] B. FISHER AND A. KILIÇMAN, *Some results on the gamma function for negative integers*, Appl. Math. Inform. Sci. **6**, 2 (2012), 173–176.
[8] I. S. GRADSHTEYN AND I. M. RYZHIK, *Table of integrals, series, and products*, Academic press, 2014.
[9] B. JOLEVSKA-TUNESKA AND I. JOLEVSKI, *Some results on the digamma function*, Appl. Math. Inform. Sci. **7**, 1 (2013), 167–170.
[10] V. KRASNIQI, *Inequalities and monotonicity for the ration of k-gamma function*, Scientia Magna **6**, 1 (2010), 40–45.
[11] C. G. KOKOLOGIANNAKI, *Properties and inequalities of generalized k-gamma, beta and zeta functions*, Int. J. Contemp. Math. Sciences **5**, 14 (2010), 653–660.
[12] C. G. KOKOLOGIANNAKI AND V. KRASNIQI, *Some properties of the k-gamma function*, Le Matematiche **68**, 1 (2013), 13–22.
[13] M. MANSOUR, *Determining the k-generalized gamma function $\Gamma_k(x)$ by functional equations*, Int. J. Contemp. Math. Sciences **4**, 21 (2009), 1037–1042.
[14] E. ÖZÇAĞ, *Results on compositions involving Dirac-delta function*, In AIP Conference Proceedings **1895**, 1 (2017), 050007.
[15] A. REHMAN, S. MUBEEN, N. SADIQ AND F. SHAHEEN, *Some inequalities involving k-gamma and k-beta functions with applications*, Journal of Inequalities and Applications **2014**, 1 (2014), 224.
[16] A. SALEM AND A. KILIÇMAN, *Estimating the polygamma functions for negative integers*, Journal of Inequalities and applications **2013**, 1 (2013), 523.

Paper JCA-13-08

[17] A. SALEM, *The neutrix limit of the q-Gamma function and its derivatives*, Applied Mathematics Letters **23**, 10 (2010), 1262–1268.
[18] A. SALEM, *Generalized the q-Digamma and the q-Polygamma Functions via Neutrices*, Filomat **31**, 5 (2017), 1475–1481.
[19] Z. SUN, A. LI AND H. QIN, *The Neutrix Limit of the Hurwitz Zeta Function and Its Application*, IAENG Int. J. Appl. Math. **47**, 1 (2017), 56–65.
[20] J. ZHANG AND H. N. SHI, *Two double inequalities for k-gamma and k-Riemann zeta functions*, Journal of Inequalities and Applications **2014**, 1 (2014), 191.