

## HERMITE–HADAMARD TYPE INEQUALITIES FOR THE $s$ -HH CONVEX FUNCTIONS VIA $k$ -FRACTIONAL INTEGRALS AND APPLICATIONS

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**Abstract.** In this paper, we first extend the concept of the HH convex function (harmonic harmonically function (see[18,19])) to  $s$ -HH convex functions and establish some fractional integral inequalities of Hermite-Hadamard type for  $s$ -HH convex functions via fractional integrals and  $k$ -fractional integrals.

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### REFERENCES

- [1] M. AVCI, H. KAVURMACI, M. EMIN OZDEMIR, *New inequalities of Hermite-Hadamard type via  $s$ -convex functions in the second sense with applications*, Appl. Math. Comp. 217 (2011), 5171–5176.
- [2] R. DIAZ, E. PARIGUAN, *On hypergeometric functions and Pochhammer  $k$ -symbol*, Divulgaciones Matemáticas, 15 (2007), 179–192.
- [3] S. S. DRAGOMIR AND R. P. AGARWAL, *Two inequalities for differentiable mappings and applications to special means of real numbers and to trapezoidal formula*, Appl. Math. Lett. 5 (1998), 91–95.
- [4] S. S. DRAGOMIR, S. FITZPATRICK, *The Hadamard's inequality for  $s$ -convex functions in the second sense*, Demonstratio Math. 32 (4) (1999), 687–696.
- [5] R. GORENFLO, F. MAINARDI, *Fractional calculus; integral and differential equations of fractional order*, Springer Verlag, Wien (1997), 223–276.
- [6] H. HUDZIK, L. MALIGRANDA, *Some remarks on  $s$ -convex functions*, Aequationes Math. 48 (1994), 100–111.
- [7] I. ISCAN, *Hermite-Hadamard type inequalities for harmonically convex functions*, Hacettepe Journal of Mathematics and Statistics, doi: 10.15672/HJMS.2014437519.
- [8] U. S. KIRMACI ET AL., *Hadamard-type inequalities for  $s$ -convex functions*, Appl. Math. Comp. 193 (2007), 26–35.
- [9] S. MILLER AND B. ROSS, *An introduction to the Fractional Calculus and Fractional Differential Equations*, John Wiley & Sons, USA, 1993, 2.
- [10] S. MUBEEN AND G. M. HABIBULLAH,  *$k$ -Fractional integrals and application*, International Journal of Contemporary Mathematical Sciences, 7 (2012), 89–94.
- [11] J. E. PEČARIĆ, F. PROSCHAN, Y. L. TONG, *Convex Functions*, Partial Orderings and Statistical Applications, Academic Press, 1991.
- [12] I. PODLUBNI, *Fractional Differential Equations*, Academic Press, San Diego, 1999.
- [13] G. ROMERO, L. LUQUE, G. DORREGO, A. AND R. CERUTTI, *On the  $k$ -Riemann-Liouville Fractional Derivative*, Int. J. Contemp. Math. Sci. 8 (1) (2013), 41–51.
- [14] E. SET, *New inequalities of Ostrowski type for mapping whose derivatives are  $s$ -convex in the second sense via fractional integrals*, Computers and Math. with Appl. 63 (2012), 1147–1154.
- [15] E. SET AND I. ISCAN, *Hermite-Hadamard type inequalities for Harmonically convex functions on the co-ordinates*, arXiv:1404.6397v1 [math.CA] 25 Apr 2014.
- [16] E. SET, M. TOMAR, M. ZEKI SARIKAYA, *On generalized Grüss type inequalities for  $k$ -fractional integrals*, Appl. Math. Comp. 8, (2015) 269:29–34. doi:10.1016/j.amc.2015.07.026.

- [17] J. TARIBOON, SOTIRIS K. NTOUYAS, M. TOMAR, *Some new integral inequalities for  $k$ -fractional integrals*, doi: 10.13140/RG.2.1.1514.6721, <http://www.researchgate.net/publication/281200353>.
- [18] W. WANG, S. G. YANG, X. Y. LIU, *Several Hermite-Hadamard Type Inequalities for Harmonically Convex Functions in the Second Sense with Applications*, *Communications in Mathematical Research*, 32(2)(2016), 105–110.
- [19] W. WANG, I. ISCAN, H. ZHOU, *Fractional integral inequalities of Hermite-Hadamard type for  $m$ -HH convex function with applications*, *Advanced Studies in Contemporary Mathematics*, 26(3), (2016), 501–512.
- [20] W. WANG, S. G. YANG, *Schur  $m$ -power convexity of a class of multiplicatively convex functions and applications*, *Abstract and Applied Analysis*, 2014, Article ID 258108, 12 pages, <http://dx.doi.org/10.1155/2014/258108>.
- [21] T. Y. ZHANG, F. QI, *Integral Inequalities of Hermite-Hadamard Type for  $m$ -AH Convex Functions*, *Turkish Journal of Analysis and Number Theory*, 2014, Vol. 2, No. 3, 60–64.