

HERMITE–HADAMARD WEIGHTED INTEGRAL INEQUALITIES FOR (h, m) –CONVEX MODIFIED FUNCTIONS

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Abstract. In this paper, some new integral inequalities of the Hermite–Hadamard type are were obtained for (h, m) -convex modified functions. The results are obtained on the basis of the introduced definition of a generalized weighted integral operator by using the convexity property, the well-known Hölder's inequality and its modification. Some results existing in the literature are some special cases of our results.

Mathematics subject classification (2020): 26D10, 26A51, 26A33.

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REFERENCES

- [1] M. A. ALI, J. E. NÁPOLES VALDÉS, A. KASHURI AND Z. ZHANG, *Fractional non conformable Hermite–Hadamard inequalities for generalized ϕ -convex functions*, Fasciculi Mathematici, **64**, (2020), 5–16, <https://doi.org/10.21008/j.0044-4413.2020.0007>.
- [2] M. ALOMARI, M. DARUS AND S. S. DRAGOMIR, *New Inequalities Of Hermite–Hadamard Type for Functions Whose Second Derivatives absolute Values Are Quasi–Convex*, Tamkang Journal Of Mathematics, **41** 4, (2010) 353–359.
- [3] J. E. NÁPOLES VALDÉS AND B. BAYRAKTAR, *A note on Hermite–Hadamard integral inequality for (h, m) -convex modified functions in a generalized framework*, Submitted.
- [4] B. BAYRAKTAR, *Some new inequalities of Hermite–Hadamard type for differentiable Godunova–Levin functions via fractional integrals*, Konuralp Journal of Mathematics, **8** (1), (2020), 91–96.
- [5] B. BAYRAKTAR, *Some Integral Inequalities Of Hermite–Hadamard Type For Differentiable (s, m) -Convex Functions Via Fractional Integrals*, TWMS J. App. Eng. Math. **10** 3, (2020) 625–637.
- [6] B. BAYRAKTAR AND M. GÜRBÜZ, *On Some Integral Inequalities for (s, m) -Convex Functions*, TWMS Journal of Applied and Engineering Mathematics **10** 2 (2020), 288–295.
- [7] B. BAYRAKTAR, A. ATTAEV AND V. KUDAEV, *Some Generalized Hadamard Type Inequalities Via Fractional Integrals*, Russian Mathematics (Iz. VUZ), **65** (2), (2021), 1–14, <https://doi.org/10.3103/S1066369X21020018>.
- [8] S. BERMUDO, P. KÓRUS AND J. E. NÁPOLES VALDÉS, *On q -Hermite–Hadamard inequalities for general convex functions*, Acta Math. Hungar. **162** (2020), 364–374, <https://doi.org/10.1007/s10474-020-01025-6>.
- [9] W. W. BRECKNER, *Stetigkeitsaussagen für eine Klasse verallgemeinerter konvexer funktionen in topologischen linearen Raumen*, Publ. Inst. Math. **23** (1978), 13–20.
- [10] S. S. DRAGOMIR, R. P. AGARWAL, *Two inequalities for differentiable mappings and applications to special means of real numbers and trapezoidal formula*, Appl. Math. Lett., **11** (5), (1998) 91–95.
- [11] S. S. DRAGOMIR AND S. FITZPATRIK, *The Hadamard's inequality for s -convex functions in the second sense*, Demonstration Math., **32** (4) (1999), 687–696.
- [12] S. S. DRAGOMIR AND C. E. M. PEARCE, *Selected Topics on Hermite–Hadamard Inequalities*, RGMIA Monographs, Victoria University, (2000), available at http://rgmia.vu.edu.au/monographs/hermite_hadamard.html.
- [13] S. S. DRAGOMIR, J. PECARIC AND L. E. PERSSON, *Some inequalities of Hadamard type*, Soochow J. Math., **21** (1995), 335–241.

- [14] J. E. HERNÁNDEZ HERNÁNDEZ, *On Some New Integral Inequalities Related With The Hermite–Hadamard Inequality via h -Convex Functions*, MAYFEB Journal of Mathematics, **4** (2017), 1–12.
- [15] H. HUDZIK AND L. MALIGRANDA, *Some remarks on s -convex functions*, Aequationes Math. **48** (1) (1994), 100–111.
- [16] S. HUSSAIN, F. AZHAR AND M. A. LATIF, *Generalized fractional Ostrowski type integral inequalities for logarithmically h -convex function*, The Journal of Analysis, **29** (2021), 1265–1278, <https://doi.org/10.1007/s41478-021-00310-z>.
- [17] P. M. GUZMÁN, J. E. NÁPOLES VALDÉS AND Y. GASIMOV, *Integral inequalities within the framework of generalized fractional integrals*, Fractional Differential Calculus, **11** (1) (2021), 69–84, <https://doi.org/10.7153/fdc-2021-11-05>.
- [18] I. IŞCAN, *A new generalization of some integral inequalities for (α, m) -convex functions*, Math Sci **7** (2013) Article: 22, <https://doi.org/10.1186/2251-7456-7-22>.
- [19] W. J. LIU, Q. A. NGO AND V. N. HUY, *Several interesting integral inequalities*, J. Mathe. Ineq. **3** (2009), 201–212.
- [20] M. MATLOKA, *On Some Integral Inequalities For (h, m) -Convex Functions*, Mathematical Economics, **9** (16) (2013), 55–70.
- [21] V. G. MIHESAN, *A generalization of the convexity*, Seminar on Functional Equations, Approx. and Convex., Cluj–Napoca (Romania) (1993).
- [22] H. MO AND X. SUI, *Hermite–Hadamard–type inequalities for generalized s -convex functions on real linear fractal set R^α , $0 < \alpha < 1$* , Math. Sci. (2017) **11**: 241–246, <https://doi.org/10.1007/s40096-017-0227-z>.
- [23] M. S. MOSLEHIAN, *Matrix Hermite–Hadamard type inequalities*, Houston J. Math., **39** (1) (2013), 177–189.
- [24] M. MUDDASSAR, M. I. BHATTI AND W. IRSHAD, *Some new s -Hermite Hadamard type inequalities for differentiable functions and their applications*, Proc. Pakistan Acad. Sci. **49** (1) (2012) 9–17.
- [25] M. MUDDASSAR, M. I. BHATTI AND W. IRSHAD, *Generalisation of integral inequalities of Hermite–Hadamard type through convexity*, Bull. Aust. Math. Soc. **88** (2) (2014), 320–330.
- [26] J. E. NÁPOLES VALDÉS, F. RABOSSO AND A. D. SAMANIEGO, *Convex Functions: Ariadne’s Thread Or Charlotte’s Spiderweb?*, Advanced Mathematical Models & Applications **5** (2) (2020), 176–191.
- [27] J. E. NÁPOLES VALDÉS, J. M. RODRÍGUEZ AND J. M. SIGARRETA, *On Hermite–Hadamard type inequalities for non-conformable integral operators*, Symmetry, **11**, (2019) 1108.
- [28] S. ÖZCAN, *Hermite–Hadamard type inequalities for m -convex and (α, m) -convex functions*, Journal of Inequalities and Applications **2020**: 175 (2020), <https://doi.org/10.1186/s13660-020-02442-5>.
- [29] M. E. ÖZDEMİR, A. O. AKDEMİR AND E. SET, *On (h, m) -Convexity And Hadamard-Type Inequalities*, arXiv:1103.6163v1, 2011 – arxiv.org.
- [30] M. Z. SARIKAYA, A. SAGLAM AND H. YILDIRIN, *On Some Hadamard-Inequalities for h -convex Functions*, Journal of Mathematical Inequalities, **2** (3) (2008), 335–341.
- [31] M. Z. SARIKAYA, A. SAGLAM AND H. YILDIRIM, *New inequalities of Hermite–Hadamard type for functions whose second derivatives absolute values are convex and quasi-convex*, International Journal of Open Problems in Computer Science and Mathematics **5** (3) (2012), <https://doi.org/10.12816/0006114>.
- [32] G. TOADER, *Some generalizations of the convexity*, Proceedings of the Colloquium on Approximation and Optimization, University Cluj–Napoca, 329–338 (1985).
- [33] J. R. WANG, X. LI, M. FECKAN AND Y. ZHOU, *Hermite–Hadamard–type inequalities for Riemann–Liouville fractional integrals via two kinds of convexity*, Applicable Analysis, **92** (11) (2012), 1–13.
- [34] B. Y. XI AND F. QI, *Inequalities of Hermite–Hadamard type for extended s -convex functions and applications to means*, J. Nonlinear Convex. Anal. **16** (5) (2015), 873–890.
- [35] B. Y. XI, D. D. GAO AND F. QI, *Integral inequalities of Hermite–Hadamard type for (α, s) -convex and (α, s, m) -convex functions*, Italian Journal Of Pure And Applied Mathematics, **44**, (2020) 499–510.