

A NOTE ON GENERALIZED HYBRID TRIBONACCI NUMBERS

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Abstract

In this paper, we introduce the generalized hybrid Tribonacci numbers. These numbers can be considered as a generalization of the generalized complex Tribonacci, generalized hyperbolic Tribonacci and generalized dual Tribonacci numbers. We also obtain some identities for these numbers.

Keywords: complex numbers, hyperbolic numbers, dual numbers, hybrid numbers, generalized Tribonacci numbers.

2010 Mathematics Subject Classification: Primary: 11B37; Secondary: 11B39, 97F50.

REFERENCES

- [1] T. Andreescu and D. Andrica, *Complex Numbers from A to ... Z* (Birkhauser/Springer, New York, 2014).
- [2] P. Catarino, *On k -Pell hybrid numbers*, *J. Discrete Math. Sci. and Cryptography* **22** (2019) 83-89.
doi:10.1080/09720529.2019.1569822
- [3] F. Catoni, R. Cannata, V. Catoni and P. Zampetti, *Hyperbolic trigonometry in two-dimensional space-time geometry*, *IL Nuovo Cimento B* **118** (2003) 475–492.
doi:10.1393/ncb/i2003-10012-9
- [4] F. Catoni, D. Boccaletti, R. Cannata, V. Catoni, E. Nichelatti and P. Zampetti, *The Mathematics of Minkowski Space-Time: With an Introduction to Commutative Hypercomplex Numbers* (Birkhauser, Basel, 2008).
- [5] G. Cerda-Morales, *On a Generalization for Tribonacci Quaternions*, *Mediterr. J. Math.* **14:239** (2017) 1–12.
doi:10.1007/s00009-017-1042-3

- [6] G. Cerda-Morales, *Investigation of Generalized Hybrid Fibonacci Numbers and Their Properties*, arXiv preprint, arXiv: 1806.02231v1 (2018).
- [7] F.M. Dimentberg, *The method of screws and calculus of screws applied to the theory of three dimensional mechanisms*, Adv. Mech. **1** (1978) 91–106.
- [8] I. Fischer, *Dual-Numbers Methods in Kinematics, Statics and Dynamics* (CRC Press, Boca Raton-London-New York-Washington D.C., 1998).
- [9] N.A. Gromov and V.V. Kuratov, *All possible Cayley-Klein contractions of quantum orthogonal groups*, Yadernaya Fizika **68** (2005) 1752–1762.
- [10] N.A. Gromov and V.V. Kuratov, *Possible quantum kinematics*, J. Math. Phys. **47** (2006) 013502–013502-9.
doi:10.1063/1.2157093
- [11] N.A. Gromov, *Possible quantum kinematics. II. Nonminimal case*, J. Math. Phys. **51** (2010) 083515–083515-12.
doi:10.1063/1.3460841
- [12] D. Hestenes, *Vectors, Spinors and Complex Numbers in Classical and Quantum Physics*, Amer. J. Phys. **39** (1971) 1013–1027.
doi:10.1119/1.1986363
- [13] V.V. Kisil, *Geometry of Mobius Transformations: Elliptic, Parabolic and Hyperbolic Actions of $SL_2(\mathbb{R})$* (Imperial College Press, London, 2012).
- [14] C. Kizilates, P. Catarino and N. Tuglu, *On the Bicomplex Generalized Tribonacci Quaternions*, Mathematics **7**, **80** (2019).
doi:10.3390/math7010080
- [15] D.P. Mandic and V.S. Lee Goh, *The Magic of Complex Numbers: Complex Valued Nonlinear Adaptive Filters* (John Wiley and Sons, Hoboken, New Jersey, 2009).
- [16] M. Özdemir, *Introduction to Hybrid Numbers*, Adv. Appl. Clifford Algebras **28** (11) 2018.
doi:10.1007/s00006-018-0833-3
- [17] S. Pethe, *Some Identities for Tribonacci Sequences*, The Fibonacci Quarterly **26** (1988) 144–151.
- [18] J. Rooney, *Generalized Complex Numbers in Mechanics*, Adv. Theory Pract. Robots Manip. Mech. Machine Sci. **22** (2014) 55–62.
- [19] A.G. Shannon and A.F. Horadam, *Some Properties of Third-Order Recurrence Relations*, The Fibonacci Quarterly **10** (1972) 135–145.
- [20] A. Szynal-Liana, *The Horadam Hybrid Numbers*, Discuss. Math. Gen. Alg. and Appl. **38** (2018) 91–98.
doi:10.7151/dmgaa.1287
- [21] A. Szynal-Liana and I. Wloch, *On Jacobsthal and Jacobsthal-Lucas Hybrid Numbers*, Ann. Math. Silesianae **33** (2019) 276–283.
doi:10.2478/amsil-2018-0009

- [22] W.B. Vasantha Kandasamy and F. Smarandache, *Dual Numbers* (Zip Publishing, Ohio, 2012).
- [23] G.R. Veldkamp, *On the use of dual numbers, vectors and matrices in instantaneous, spatial kinematics*, *Mech. Mach. Theory* **11** (1976) 141–156.
doi:10.1016/0094-114X(76)90006-9
- [24] I.M. Yaglom, *Complex Numbers in Geometry* (Academic Press, New York, 1968).
- [25] I.M. Yaglom, *A Simple Non-Euclidean Geometry and Its Physical Basis* (Springer-Verlag, New York, 1979).
- [26] C.C. Yalavigi, *Properties of Tribonacci numbers*, *The Fibonacci Quarterly* **10** (1972) 231–246.

Received 2 July 2019
Revised 30 January 2020
Accepted 7 June 2020