

HYPERNUMBERS AND OTHER EXOTIC STUFF



(1) MORE ON THE "ARITHMETICAL" SIDE

Tropical Arithmetics

Introduction to Tropical Geometry - Diane Maclagan and Bernd Sturmfels

<http://www.cs.technion.ac.il/~janos/COURSES/238900-13/Tropical/MaclaganSturmfels.pdf>

https://en.wikipedia.org/wiki/Min-plus_matrix_multiplication

https://en.m.wikipedia.org/wiki/Tropical_geometry#Algebra_background

https://en.wikipedia.org/wiki/Amoeba_%28mathematics%29

https://www.youtube.com/watch?v=1_ZfvQ3o1Ac (friendly introduction)

https://en.wikipedia.org/wiki/Log_semiring

<https://en.wikipedia.org/wiki/LogSumExp>

Tight spans, Isbell completions and semi-tropical modules - Simon Willerton

<https://arxiv.org/pdf/1302.4370.pdf> (one half of the tropical semiring)

Hyperfields for Tropical Geometry I. Hyperfields and dequantization - Oleg Viro

<https://arxiv.org/pdf/1006.3034.pdf> (see section "6. Tropical addition of complex numbers")

Supertropical quadratic forms II: Tropical trigonometry and applications -

Zur Izhakian, Manfred Knebusch and Louis Rowen -

https://www.researchgate.net/publication/326630264_Supertropical_Quadratic_forms_II_Tropical_Trigonometry_and_Applications

Tropical geometry to analyse demand - Elizabeth Baldwin and Paul Klemperer

http://elizabeth-baldwin.me.uk/papers/baldwin_klemperer_2014_tropical.pdf

International Trade Theory and Exotic Algebras - Yoshinori Shiozawa

<https://link.springer.com/article/10.1007/s40844-015-0012-3>

Arborescent numbers: higher arithmetic operations and division trees - Henryk Trappmann

http://eretrandre.org/rb/files/Trappmann2007_81.pdf

Tetration Reference - Henryk Trappman and Andrew Robbins

<https://math.eretrandre.org/tetrationforum/attachment.php?aid=387>

Open problems in tetration

<https://math.eretrandre.org/tetrationforum/showthread.php?tid=162>

Applications of tetration

<https://math.stackexchange.com/questions/199862/what-is-the-geometric-physical-or-other-meaning-of-the-tetration>

The family of arithmetics of Ruggero Maria Santilli

<http://www.santilli-foundation.org/docs/10.11648.j.ajmp.s.2015040501.14.pdf>

Isodual Theory of Antimatter with applications to Antigravity, Grand Unification and Cosmology

<https://www.amazon.com/Isodual-Theory-Antimatter-applications-Antigravity/dp/1402045174> (book)

Studies on Santilli's Isonumber Theory - Arun S. Muktibodh

<http://www.santilli-foundation.org/docs/pdf2.pdf>

Elements of Hadronic Mechanics III Experimental verifications - R.M.Santilli

<http://www.santilli-foundation.org/docs/elements-hadronic-mechanics-iii.compressed.pdf>

Initiating Santilli's Iso-Mathematics to Triplex Number... - Nathan O. Schmidt and Reza Katebi

<http://vixra.org/pdf/1308.0051v2.pdf>

<http://thunder-energies.com/> && <http://www.santilli-foundation.org>

The Development of Hyper-Dual Numbers for Exact Second-Derivative Calculations

Jeffrey A. Fike and Juan J. Alonso

http://adl.stanford.edu/hyperdual/Fike_AIAA-2011-886_slides.pdf

Saturation Arithmetics

https://en.wikipedia.org/wiki/Saturation_arithmetic

Symmetric level index - https://en.wikipedia.org/wiki/Symmetric_level-index_arithmetic

A Hybrid Number Representation Scheme Based on Symmetric Level-Index Arithmetic

Xunyang Shen and Peter R. Turner -

[https://www.researchgate.net/publication/](https://www.researchgate.net/publication/221142816)

[221142816 A Hybrid Number Representation Scheme Based on Symmetric Level-Index Arithmetic](https://www.researchgate.net/publication/221142816)

ZEA A zero-free exact arithmetic - Dominique Michelucci and Jean-Michel Moreau

<https://www.researchgate.net/publication/220991026> ZEA - A zero-free exact arithmetic

On quantum state of numbers - Bernard Le Stum & Adolfo Quirós

<https://arxiv.org/pdf/1310.8143.pdf>

Half-exponential function - https://en.wikipedia.org/wiki/Half-exponential_function

Matrix exponential - https://en.wikipedia.org/wiki/Matrix_exponential

Baker–Campbell–Hausdorff formula

https://en.wikipedia.org/wiki/Baker%E2%80%93Campbell%E2%80%93Hausdorff_formula

Circuits over sets of natural numbers

https://en.wikipedia.org/wiki/Circuits_over_sets_of_natural_numbers

The complexity of circuit evaluation over the natural numbers - Pierre McKenzie and Klaus Wagner
<http://www.iro.umontreal.ca/~mckenzie/Dagstuhl02.pdf>

The Unwinding Number - Robert M. Corless and David J. Jeffrey
<https://faculty.e-ce.uth.gr/akritas/CE102/p28-corless.pdf>

Generalized distributive law
https://en.wikipedia.org/wiki/Generalized_distributive_law

A Noncommutative Version of the Natural Numbers - Tyler Foster
<https://arxiv.org/pdf/1003.2081.pdf>

Generalization of the unit interval - William M. Cornette
https://projecteuclid.org/download/pdf_1/euclid.pjm/1102818012

Numeristics - Kevin Carmody
<https://kevincarmody.com/math/numeristics.pdf>

Construction, properties and applications of finite neofield - Anthony Donald Keedwell
https://dml.cz/bitstream/handle/10338.dmlcz/119164/CommentatMathUnivCarolRetro_41-2000-2_8.pdf

Quantity Calculus - https://en.wikipedia.org/wiki/Quantity_calculus
<http://ingvar.web03.cefit.se/wp-content/uploads/2016/02/physics6.pdf>
Metrological Thinking Needs the Notions of Parametric Quantities, Units, and Dimensions
Ingvar Johansson

Solving Cubic Equations with Curly Roots - Dan Kalman and Maurice Burke
<https://www.jstor.org/stable/10.5951/mathteacher.108.5.0392?seq=1>

The eightfold path to nonstandard analysis - Vieri Benci, Mauro Di Nasso and Marco Forti
https://www.researchgate.net/profile/Vieri_Benci/publication/228753190_The_eightfold_path_to_nonstandard_analysis/links/0deec52e248b66edc100000/The-eightfold-path-to-nonstandard-analysis.pdf

Hypernumbers and Extrafunctions: Extending the Classical Calculus - Mark Burgin
<https://www.amazon.com/Hypernumbers-Extrafunctions-Extending-SpringerBriefs-Mathematics/dp/1441998748>

Ordinal number - https://en.wikipedia.org/wiki/Ordinal_number
Mex - [https://en.wikipedia.org/wiki/Mex_\(mathematics\)](https://en.wikipedia.org/wiki/Mex_(mathematics))

Parallel - [https://en.wikipedia.org/wiki/Parallel_\(operator\)](https://en.wikipedia.org/wiki/Parallel_(operator))

Alternative models of the real number line in physics - D. K. Ross
<https://link.springer.com/article/10.1007/BF02213428>
Can There Be an Alternative Mathematics, Really? - Jean Paul Van Bendegen
https://link.springer.com/chapter/10.1007%2F0-387-24270-8_30

Continuum between addition, multiplication and exponentiation

<https://math.stackexchange.com/questions/1269643/continuum-between-addition-multiplication-and-exponentiation>

The five fundamental operations of mathematics: addition, subtraction, multiplication, division, and modular forms - Kenneth A. Ribet – <https://math.berkeley.edu/~ribet/trinity.pdf>

Engel expansion - https://en.wikipedia.org/wiki/Engel_expansion

Arithmetic Geometric Mean – https://en.wikipedia.org/wiki/Arithmetic%E2%80%93geometric_mean
Gauss, Landen, Ramanujan, the Arithmetic-Geometric Mean, Ellipses, π , and the Ladies Diary
Gert Almkvist and Bruce Berndt - https://link.springer.com/chapter/10.1007%2F978-3-319-32377-0_8

The total differential, the Cauchy-Riemann equations and the Elysian infinitesimals - Kerry Bemis

Heinz mean - https://en.wikipedia.org/wiki/Heinz_mean

Identric mean - https://en.wikipedia.org/wiki/Identric_mean

Logarithmic mean - https://en.wikipedia.org/wiki/Logarithmic_mean

Hypertranscendental number

https://en.wikipedia.org/wiki/Hypertranscendental_number

Infinite compositions of analytic functions

https://en.wikipedia.org/wiki/Infinite_compositions_of_analytic_functions

Racks and quandles - https://en.wikipedia.org/wiki/Racks_and_quandles

A quest for Exactness : machines, algebra and geometry for tractional constructions of differential equations -Pietro Milici – <https://tel.archives-ouvertes.fr/tel-01889365/document>
(See section "7.3 Open problems and perspectives")

Multiplicative calculus - https://en.wikipedia.org/wiki/Multiplicative_calculus

Fractal derivative - https://en.wikipedia.org/wiki/Fractal_derivative

Alternative mathematical notation and its applications in calculus - Jakub Marian

https://jakubmarian.com/data/bachelor_thesis.pdf

Los misterios de la fracción prohibida - Claudi Alsina and Carme Burgués

The mysteries of the forbidden fraction (title translated)

<https://revistasuma.es/IMG/pdf/56/039-042.pdf>

Mediant - [https://en.wikipedia.org/wiki/Mediant_\(mathematics\)](https://en.wikipedia.org/wiki/Mediant_(mathematics))

https://en.wikipedia.org/wiki/Ford_circle

https://en.wikipedia.org/wiki/Minkowski%27s_question-mark_function

Dialogue on n colored numbers - Armahedi Mahzar

https://issuu.com/armahedimahzar/docs/dialogue_on_n-colored_nubers

Some remarks on the pseudo-linear algebra - Andrea markova

<https://www.sav.sk/journals/uploads/1203130414marko.pdf>

Pseudo-arithmetical operations as a basis for the general measure and integration theory - Pietro Benvenuti and Radko Mesiar - <https://www.sciencedirect.com/science/article/pii/S0020025503002111>

Hofstadter sequences - https://en.wikipedia.org/wiki/Hofstadter_sequence

Mallows' Sequence - <https://mathworld.wolfram.com/MallowsSequence.html>

Negative Math: How Mathematical Rules Can Be Positively Bent (book) - Alberto A. Martínez

<https://www.amazon.com/Negative-Math-Mathematical-Rules-Positively-ebook/dp/B07DMVNZVP>

(Algebra of quantities, history and variations of the algebra of signs)

Interval Arithmetic - https://en.wikipedia.org/wiki/Interval_arithmetic

Theories of Interval Arithmetic Mathematical Foundations and Applications - Hend Dawood (book)

<https://www.academia.edu/1976964/>

[Theories of Interval Arithmetic Mathematical Foundations and Applications](#)

Graphs operations - https://en.wikipedia.org/wiki/Graph_operations

Summation $1+2+3+4+\dots$

https://en.wikipedia.org/wiki/1_%2B_2_%2B_3_%2B_4_%2B_%E2%8B%AF

Umbral Calculus - https://en.wikipedia.org/wiki/Umbral_calculus

Progress Report on Hyper-operations (Zeration)

<https://math.eretrandre.org/tetrationforum/attachment.php?aid=251>

Ackermann's Function and New Arithmetical Operations (zeration)

[http://www.rotarysaluzzo.it/Z_Vecchio_Sito/filePDF/Iperoperazioni%20\(1\).pdf](http://www.rotarysaluzzo.it/Z_Vecchio_Sito/filePDF/Iperoperazioni%20(1).pdf)

Constantin A. Rubtsov and Giovanni F. Romerio

Constant problem - https://en.wikipedia.org/wiki/Constant_problem

Theory of holors (book) - Parry Moon and Domina Eberle Spencer

<https://www.amazon.com/Theory-Holors-Generalization-Moon-Spencer/dp/0521019001>

J vocabulary- <https://code.jssoftware.com/wiki/NuVoc>

Generalized inverse - https://en.wikipedia.org/wiki/Generalized_inverse

Supermatrix - <https://en.wikipedia.org/wiki/Supermatrix>

Hyperdeterminant - <https://en.wikipedia.org/wiki/Hyperdeterminant>

...some others can be found in

https://en.wikipedia.org/wiki/List_of_types_of_numbers

(2) MORE ON THE "NUMERAL" SIDE

Lunar Arithmetic or Dismal Arithmetics - David Applegate, Marc LeBrun and N. J. A. Sloane

<https://cs.uwaterloo.ca/journals/JIS/VOL14/Sloane/carry2.pdf>
<https://www.youtube.com/watch?v=cZkGeR9CWbk>
<http://www.info.deis.unical.it/~yaro/Numerals%20and%20Factorization.pdf>

Balanced Ternary - https://en.wikipedia.org/wiki/Balanced_ternary
https://pt.wikipedia.org/wiki/Tern%C3%A1rio_balanceado#/media/Ficheiro:Balanced_ternary.svg

Double-Base Number System for Multi-Scalar Multiplications
Christophe Doche, David R. Kohel and Francesco Sica
<https://www.iacr.org/archive/eurocrypt2009/54790501/54790501.pdf>

Skew binary number system - https://en.wikipedia.org/wiki/Skew_binary_number_system
Two Skew-Binary Numeral Systems and One Application - Amr Elmasry and Jyrki Katajainen
<http://cphstl.dk/Paper/TOCS-2011/journal.pdf>

Zero Displacement Ternary Number System : the most economical way of representing numbers -
Fernando Guilherme Silvano Lobo Pimentel
https://www.researchgate.net/publication/258241283_Zero_Displacement_Ternary_Number_System_the_most_economical_way_of_representing_numbers

Quote Notation - Eric C. R. Hehner and R. N. S. Horspool
<http://www.cs.toronto.edu/~hehner/ratno.pdf>
https://en.wikipedia.org/wiki/Quote_notation

Beyond the Complexes: Toward a lattice based number system - J. Köpflinger, J. A. Shuster
<https://www.cs.du.edu/~petr/milehigh/2013/Koeplinger.pdf>

Linear Numeral System - Ian Mackie - <http://www.ianmackie.com/papers/linns.pdf>

New approach could sink floating point computation, John Leroy Gustafson
<https://www.nextplatform.com/2019/07/08/new-approach-could-sink-floating-point-computation/>
https://en.wikipedia.org/wiki/Double-precision_floating-point_format

The residue logarithmic number system: Theory and implementation - Mark G. Arnold
https://www.researchgate.net/publication/4156476_The_residue_logarithmic_number_system_Theory_and_implementation

A Low-Power Two-Digit Multi-dimensional Logarithmic Number System Filterbank Architecture for a Digital Hearing Aid -- Roberto Muscedere, Vassil Dimitrov, Graham Jullien and William Miller
https://www.researchgate.net/publication/26532063_A_Low-Power_Two-Digit_Multi-dimensional_Logarithmic_Number_System_Filterbank_Architecture_for_a_Digital_Hearing_Aid

Methodology of numerical computations with infinities and infinitesimals - Yaroslav D. Sergeyev
[http://www.theinfinitycomputer.com/The_second_paper_to_read_\(Lagrange_Lecture\).pdf](http://www.theinfinitycomputer.com/The_second_paper_to_read_(Lagrange_Lecture).pdf)
<https://www.numericalinfinities.com/>

Hetero Base Arithmetic Operation - Raghavendra Lingayya (????)
<http://www.numbersystem.org/hetero-base-arithmetic-operations.html>

Zot-Binary: a new numbering system with an application on big-integer multiplication - Shahram Jahani and Azman Samsudin - <http://www.jatit.org/volumes/Vol48No1/5Vol48No1.pdf>

Decimal Fractions - https://en.wikipedia.org/wiki/Simon_Stevin#Decimal_fractions

A Number System with Continuous Valued Digits and Modulo Arithmetic - Aryan Saèd, Majid Ahmadi and Graham A. Jullien
<https://www.academia.edu/13000520/>
[A number system with continuous valued digits and modulo arithmetic](#)

Hereditary Base notation -
https://en.wikipedia.org/wiki/Goodstein%27s_theorem#Hereditary_base-n_notation

New Arithmetic Algorithms for Hereditarily Binary natural numbers - Paul Tarau
<https://www.cse.unt.edu/~tarau/research/2014/HBinX.pdf>

Predicting Improper Fractional Base Integer Characteristics - Billy Dorminy
<http://educ.jmu.edu/~lucassk/Papers/DorminyFracBase.pdf>

Horus Eye Fractions - https://en.wikipedia.org/wiki/Eye_of_Horus#Mathematics
Finger Binary - https://en.wikipedia.org/wiki/Finger_binary
Nemeth braille - https://en.wikipedia.org/wiki/Nemeth_Braille

Bibi-binary -- <https://en.wikipedia.org/wiki/Bibi-binary>

Quater-imaginary base - https://en.wikipedia.org/wiki/Quater-imaginary_base

QUANTUM-LANGUAGE-PARSE-SYNTAX-GRAMMAR
https://en.wikipedia.org/wiki/David_Wynn_Miller#Miller's_description_of_his_work_and_views
<https://github.com/lismore/MathematicalInterfaceForLanguage/blob/master/README.md>
<https://dwmlc.com/>

The Denormal Logarithmic Number System - Mark G. Arnold Sylvain Collange
https://www.researchgate.net/publication/262371524_The_Denormal_Logarithmic_Number_System

The generalized golden proportions, a new theory of real numbers, and ternary mirror-symmetrical arithmetic - Alexey Stakhov - <http://fs.unm.edu/SN/TheGeneralizedGolden.pdf>

Computing with Exact Real Numbers in a Radix-r System - Alexander Kaganovsky
https://www.researchgate.net/publication/220368828_Computing_with_Exact_Real_Numbers_in_a_Radix-r_System

A variant of Ostrowski numeration - Emmanuel Cabanillas
<https://arxiv.org/pdf/1904.01874v2.pdf>

https://oeis.org/wiki/LCM_numeral_system
https://oeis.org/wiki/Factorial_numeral_system
https://en.wikipedia.org/wiki/Factorial_number_system

https://oeis.org/wiki/Primorial_numerical_system
<http://www.thefullwiki.org/Combinadic>

Octomatics number system - <http://octomatics.org/>

Sandpiles - Luis David Garcia-Puente
<https://www.youtube.com/watch?v=1MtEUErz7Gg>
<http://people.reed.edu/~davidp/>

Super omega - https://en.wikipedia.org/wiki/Chaitin%27s_constant#Super_Omega

Esolang – https://esolangs.org/wiki/Main_Page

https://en.wikipedia.org/wiki/Approximate_number_system
https://en.wikipedia.org/wiki/Numerical_cognition
https://en.wikipedia.org/wiki/Number_sense_in_animals
Together with dyscalculia, ageometresia, dysgraphia, financial illiteracy
https://en.wikipedia.org/wiki/Innumeracy_%28book%29

Location arithmetic - https://en.wikipedia.org/wiki/Location_arithmetic

...some can be found in the following wikipedia links :
https://en.wikipedia.org/wiki/List_of_numerical_systems
https://en.wikipedia.org/wiki/Category:Non-standard_positional_numerical_systems
https://en.wikipedia.org/wiki/Non-standard_positional_numerical_systems

Real Computation https://en.wikipedia.org/wiki/Real_computation
Hypercomputation <https://en.wikipedia.org/wiki/Hypercomputation>
Unconventional computing (list) https://en.wikipedia.org/wiki/Unconventional_computing

(3) MORE ON THE "GEOMETRICAL" SIDE

Cubic Pythagoras – Luis Teia (pythagoras with cubes instead of squares)
<https://wonderfuleengineering.com/pythagoras-theorem-has-been-upgraded-to-3d-and-now-requires-a-120-page-proof/>
https://www.youtube.com/channel/UCcoPpQFHQsv6pDzMgVI_pRw/videos?view=0&sort=dd&shelf_id=0

A Mathematical Theory of Origami Constructions and Numbers - Roger C. Alperin
<https://arxiv.org/pdf/math/9912039v1.pdf>

Teoría de Galois tras el Origami - Alberto Garcia Diaz
<https://riull.ull.es/xmlui/bitstream/handle/915/5795/Teoria%20de%20Galois%20tras%20el%20origami.%20Por%20que%20el%20origami%20resuelve%20los%20problemas%20geometricos%20clasicos%20de%20la%20Antigua%20Grecia..pdf?sequence=1&isAllowed=y>

Origami-Constructible Numbers - James King
<https://www.cs.mcgill.ca/~jking/papers/origami.pdf>

Theory of 3D complex space and complex number of 3D space, applications and experimental validation techniques - L.T. Abobda

https://www.researchgate.net/publication/301627462_Theory_of_3D_complex_space_and_complex_number_of_3D_space_applications_and_experimental_validation_techniques

Truly hypocomplex numbers : Unification of numbers and vectors - Redouane Bouhennache
<https://arxiv.org/pdf/1409.2757.pdf>

On a novel 3D hypercomplex number system - Shlomo Jacobi
<https://arxiv.org/pdf/1509.01459.pdf>

Hypercomplex number in three dimensional spaces - Abdelkarim Assoul
https://www.researchgate.net/publication/308969073_Hypercomplex_number_in_three_dimensional_spaces_hal-01686021

Introduction to the General Trigonometry in Euclidian 2D-space - Claude Ziad Bayeh
<http://www.wseas.us/e-library/transactions/mathematics/2012/53-882.pdf>

Solving Quaternion Quadratic Equations - Peter Michael Jack
<https://archive.org/details/q2wp01>

A System of Three-Dimensional complex variables - E. Dale Martin
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19880004569.pdf>

Rational trigonometry - Norman J. Wildberger
<https://www.youtube.com/user/njwildberger>
https://en.wikipedia.org/wiki/Rational_trigonometry

Generalizaciones de los números: de la aritmética a las variedades diferenciables - Fernando Etayo Gordejuela
<https://repositorio.unican.es/xmlui/bitstream/handle/10902/13817/2016GacRSocMatEspGeneralization.pdf?sequence=1&isAllowed=y>

Ensemble de nombres - Taladris, Silk78, Seirios, Telchar, Tigerfou and Médiat

Fractals arithmétiques - Jean-Pierre Reveilles
<http://numerisation.univ-irem.fr/ST/IST93018/IST93018.pdf>

List of fractals by Hausdorff dimension
https://en.wikipedia.org/wiki/List_of_fractals_by_Hausdorff_dimension

Fractal wheel
https://ksr-ugc.imgix.net/assets/004/987/498/d1d3926f15a17d6194a07825630d3424_original.gif?ixlib=rb-2.1.0&w=680&fit=max&v=1448600022&auto=format&gif-q=50&q=92&s=9851a96b94a4aaab1fdf587ccd3e5647

An Intrinsically Three-Dimensional Fractal -- M. Fernández-Guasti
https://www.researchgate.net/publication/267132753_An_Intrinsically_Three-Dimensional_Fractal

List of Coordinate Systems

https://en.wikipedia.org/wiki/Category:Coordinate_systems
<https://www.gbv.de/dms/goettingen/198419775.pdf>

On the Extension of Complex Numbers - Nicholas Gauguin Houghton-Larsen
<https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.304.5052&rep=rep1&type=pdf>

Trilinear Coordinates - <https://mathworld.wolfram.com/TrilinearCoordinates.html>
Barycentric Coordinates - <https://mathworld.wolfram.com/BarycentricCoordinates.html>
Synergetics Coordinates - <https://mathworld.wolfram.com/SynergeticsCoordinates.html>
Special Isocubics in the Triangle Plane - Jean-Pierre Ehrmann and Bernard Gibert
<https://bernard-gibert.pagesperso-orange.fr/files/Resources/SITP.pdf>
Transformation of trilinear and quadriplanar to and from cartesian coordinates -John B Mertie
http://www.minsocam.org/ammin/AM49/AM49_926.pdf

An introduction to the perplex number system - Jerry Chandler
<https://core.ac.uk/download/pdf/81127362.pdf>

A New and Very Long Proof of the Pythagoras Theorem - Kaushik Basu
<http://kaushikbasu.org/Pythagoras%206.pdf>

Blog about the 3d complex numbers and other related stuff
<http://3dcomplexnumbers.net/>

P-adics numbers

The p-adic integers - Brian Courthoute, Pablo Guzman and Antoine Ronk
<http://math.uni.lu/eml/projects/reports/P-adics.pdf>

A first introduction to p-adic numbers - David A. Madore
<http://www.madore.org/~david/math/padics.pdf>

Polynorms, Norms, Metrics, and Polyangles - R R Aidagulov and M V Shamolin
https://www.researchgate.net/publication/270597014_Polynorms_Norms_Metrics_and_Polyangles
Finsler Spaces, Bingles, Polyangles, and Their Symmetry Groups -
R. R. Aidagulov and Maxim V. Shamolin
https://www.researchgate.net/publication/270597384_Finsler_Spaces_Bingles_Polyangles_and_Their_Symmetry_Groups

Web "3d Math Secrets" (????) - <https://www.3dmathsecrets.com/breakthrough>

The non-equality between curve and the straight line - Walter Meyer
<http://curiosidadesmatematicas.cl/wordpress/aclaracion/>

Isotropic line - https://en.wikipedia.org/wiki/Isotropic_line

Understanding & Using "nuReal numbers" - John A. Shuster

Proportion functions in three dimensions - Claudi Alsina and Walter Benz
<https://link.springer.com/article/10.1007/BF01836452>

Misbehaved lines

<https://i.stack.imgur.com/kYCs0.png>
https://static.scientificamerican.com/blogs/cache/file/AEE64282-EF71-4F2C-AA9557A9188E1C2F_agenda.jpg
https://xorhammer.files.wordpress.com/2010/03/sheaf2_line.png
https://www.modelrailforum.com/forums/uploads/1439922327/gallery_15688_407_150853.jpg

An algorithm for multiplication of trintaduonions – Alexandr Cariow and Galina Cariowa
<https://pdfs.semanticscholar.org/2a77/5a4f39ba0a0d1ceb34b3e0a1c2223117d680.pdf>

Circular and Hyperbolic Quaternions, Octonions, and Sedenions - Kevin Carmody
<https://www.sciencedirect.com/science/article/abs/pii/S0096300388901336>

Musean hypernumbers - <http://www.house-of-horus.de/hypernumbers.html>
<https://en.wikipedia.org/w/index.php?title=Hypernumber&oldid=78200756>
Elliptic complex numbers with dual multiplication - John Shuster and Jens Koplinger
http://www.jenskoeplinger.com/P/PaperShusterKoepl_WSpace.pdf
Doubly nilpotent numbers in the 2D plane - John Shuster and Jens Koplinger
<http://www.jenskoeplinger.com/P/PaperShusterKoepl-PQSpace.pdf>

Fractal dimension and Wada measure revisited : no straightforward relationships in NDDS - Pranas Ziaukas and Minvydas Ragulskis
https://nonlinear.fmf.ktu.lt/Papers/ND_2017_v2.pdf
https://en.wikipedia.org/wiki/Lakes_of_Wada

Three Gears are Possible – Numberphile - https://www.youtube.com/watch?v=5Mf0JpTI_gg

Trigonometry of a tetrahedron - https://en.wikipedia.org/wiki/Trigonometry_of_a_tetrahedron
Solid Geometry with Problems and Applications - H. E. Slaught and N. J. Lennes
<https://www.gutenberg.org/files/29807/29807-pdf.pdf>

Introduction to the circular number line - Dharmendra Kumar Yadav
https://www.researchgate.net/publication/301552425_INTRODUCTION_OF_A_CIRCULAR_NUMBER_LINE
A new approach to ordering complex numbers - Dharmendra Kumar Yadav
https://www.researchgate.net/publication/267465398_A_new_approach_to_ordering_complex_numbers

The vector algebra war: a historical perspective
James M. Chappell, Azhar Iqbal, John G. Hartnett, and Derek Abbott
<https://arxiv.org/pdf/1509.00501.pdf>

Polysign Numbers - Tim Golden
<http://www.bandtechnology.com/PolySigned/index.html>
Notas Sobre Polisignos Y Objetos Tertiarios - Kujonai
<https://vixra.org/pdf/2002.0570v1.pdf>

Tau manifesto
<https://tauday.com/tau-manifesto>
<https://hexnet.org/files/documents/tau-manifesto.pdf>

New Calculus - John Gabriel

https://www.youtube.com/channel/UCIBbBVLs3M-d3dNgU4Vop_A/videos

<http://thenewcalculus.weebly.com/>

A complex and Triplex framework for encoding the riemannian dual space-time topology equipped with order parameters fields - N. O. Schmidt

[https://www.researchgate.net/publication/](https://www.researchgate.net/publication/236735724_A_complex_and_triplex_framework_for_encoding_the_Riemannian_dual_space-time_topology_equipped_with_order_parameter_fields)

[236735724 A complex and triplex framework for encoding the Riemannian dual space-time topology equipped with order parameter fields](https://www.researchgate.net/publication/236735724_A_complex_and_triplex_framework_for_encoding_the_Riemannian_dual_space-time_topology_equipped_with_order_parameter_fields)

A Possible Solution of Trisection Problem - Siavash H. Sohrab

<http://www.wseas.us/e-library/conferences/2012/CambridgeUSA/MATHCC/MATHCC-44.pdf>

Approach on area coordinate, volume coordinate and their usage in true 3dgis

Gang Liao, Qingyuan Li, Xu Chen and Jiarong Zheng

[https://www.researchgate.net/publication/](https://www.researchgate.net/publication/242605764_APPROACH_ON_AREA_COORDINATE_VOLUME_COORDINATE_AND_THEIR_USAGE_IN_TRUE_3DGIS)

[242605764 APPROACH ON AREA COORDINATE VOLUME COORDINATE AND THEIR USAGE IN TRUE 3DGIS](https://www.researchgate.net/publication/242605764_APPROACH_ON_AREA_COORDINATE_VOLUME_COORDINATE_AND_THEIR_USAGE_IN_TRUE_3DGIS)

Areal Co-ordinate Methods in Euclidean Geometry - Tom Lovering

<https://bmos.ukmt.org.uk/home/areals.pdf>

Semi-Complex Analysis & Mathematical Physics - F. Antonuccio

<https://arxiv.org/pdf/gr-qc/9311032.pdf>

Hex Grid Geometry for Game Developers - Herman Tulleken

<http://gamelogic.co.za/downloads/HexMath2.pdf>

Cognitive-Theoretic Model of the Universe (CTMU) Christopher Langan <http://hology.org/>

Non-well-founded set theory - https://en.wikipedia.org/wiki/Non-well-founded_set_theory

Mathematical surprises in 3d (some observations and open problems in r3)

<http://claudialsina.com/sorpresas-matematicas-en-3d>

"Quaternions - Redundancy + Efficiency = Ternions" - Ulrich Mutze

<http://www.ulrichmutze.de/articles/05-53.pdf>

OMIC's N-nion's site - anonymous author - <http://asyncbrain.baf.cz/m/nt/index.htm>

The trinion Fourier transform of color images -

Dawit Assefa, Lalu Mansinha, Kristy F. Tiampo, Henning Rasmussen and Kenzu Abdella -

https://www.academia.edu/3835064/The_trinion_Fourier_transform_of_color_images

Three-Dimensional Wind Profile Prediction with Trinion-Valued Adaptive Algorithms -

Zhi Wen Liu, Wei Liu and You Gen Xu -

[https://www.researchgate.net/publication/278048724_Three-](https://www.researchgate.net/publication/278048724_Three-Dimensional_Wind_Profile_Prediction_with_Trinion-Valued_Adaptive_Algorithms)

[Dimensional Wind Profile Prediction with Trinion-Valued Adaptive Algorithms](https://www.researchgate.net/publication/278048724_Three-Dimensional_Wind_Profile_Prediction_with_Trinion-Valued_Adaptive_Algorithms)

Vectors, Cyclic Submodules and Projective Spaces Linked with Ternions -

Hans Havlicek and Metod Saniga -

https://www.researchgate.net/publication/1737480_Vectors_Cyclic_Submodules_and_Projective_Spaces_Linked_with_Ternions

Wasan Geometry and Division by Zero Calculus - Hiroshi Okumura and Saburo Saitoh
https://www.researchgate.net/publication/329210266_Wasan_Geometry_and_Division_by_Zero_Calculus

Ternary numbers and algebras - Alexey Dubrovski and Guennadi Volkov
<https://arxiv.org/pdf/hep-th/0608073.pdf>

On Unconventional Division by Zero - Jakub Czajko
<http://www.worldscientificnews.com/wp-content/uploads/2018/04/WSN-99-2018-133-147.pdf>

(4) Others

The Great Pi Conspiracy - Mark and Scott Wollum
<https://omnithought.org/great-pi-conspiracy/2584>

Andre Joyce
http://untilheaven.tripod.com/transfinite_mathematics_made_easy.htm
http://untilheaven.tripod.com/andre_joyce_s_coined_words.htm

Quasic blog - L. Edgar Otto
<https://pesla.blogspot.com/>

Spiritual Mathematics: Introduction to the Circular Number System – John Dunne-Brady
https://books.google.cl/books?id=dDPgAgAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Nova processes - Ted Gress
<https://www.twilightraven.net/>
<http://vixra.org/pdf/1804.0337v1.pdf>

Tetryonics – <https://tetryonics.com/>

Crank Dot Net - List of bizarre mathematics
Erik Max Francis – <http://www.crank.net/math.html>

Where is the frontier between "mathematics" and "pseudo-mathematics"?
<https://en.wikipedia.org/wiki/Pseudomathematics>

Pseudo-mathematics VS Proto-mathematics

Can exist "dissident" mathematicians in a similar way of "dissident" scientists?
https://www.academia.edu/37679452/Jean_de_Climont_-_The_worldwide_list_of_dissident_scientists_1-500_-_Part_1.pdf

(5) LISTS OF LISTS OF OPEN PROBLEMS

Darpa 23 Maths Problems

<https://compmath.wordpress.com/about/10-the-big-picture-darpas-23-challenge-questions/>

Problems of the Wolfram Project

<https://www.wolframscience.com/openproblems/NKSOOpenProblems.pdf>

<http://mathworld.wolfram.com/UnsolvedProblems.html>

Open problems in Mathematics - John Forbes Nash Jr and Michael Rassias

<http://www.mthrasias.com/data/uploads/bfm3a978-3-319-32162-22f1.pdf>

