19th International Geometry Symposium

27 - 30 June 2022

Trakya University - Edirne / Turkey

Book of Abstracts

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19TH INTERNATIONAL GEOMETRY SYMPOSIUM

ABSTRACTS BOOK

Proceedings of the 19th International Geometry Symposium

Edited By:
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Proceedings of the 19th International Geometry Symposium

27 - 30 June 2022
Edirne, Turkey

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Foreword

The 19th International Geometry Symposium, hosted by Trakya University between 27-30 June 2022, was held in the beautiful city of Edirne. Edirne is an important border city in the north-west of Turkey, it was one of the capital of the Ottoman Empire. It is even said that Edirne is an open museum. It is a nice coincidence that this year is the 40th founding year of our university.

The main purpose of this symposium, which is to make and share studies for the development, understanding and dissemination of geometry, was realized. In addition to new researchers, undergraduate and graduate students aiming to conduct scientific studies also had the opportunity to meet with highly experienced researchers.

All work in this booklet has been brought to the attention of viewers after peer-review, either face to face or online. Invited speakers helped researchers explore some new ways of thinking through their presentations.

We would like to thank Trakya University Rectorate and Geometricians Association for the realization of our event. We would also like to thank all our colleagues and students who worked with us to make this symposium successful.



Prof. Dr. Figen ÖKE
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Symposium Programme

19th INTERNATIONAL GEOMETRY SYMPOSIUM

Note that all times listed on the schedule are shown as UTC/GMT +3 , i.e. the time in TURKEY . Please, gauge the time difference to your time zone.

June 27, 2022	
09:00-10:00	Registration
10:00--11:00	Openning Ceremony
11:00--11:15	Coffee Break
11:15--12:00	Plenary talk : Prof. Dr. SALİM YÜCE "New Horizons on Holditch Theorem"
12:00--12:15	Coffee Break
12:15--13:00	Plenary talk: Prof. Dr. Hans-Peter SCHROECKER
	"From the Factorization of Motions to the Factorization of Darboux Cyclides"
13:00--14:30	Lunch
14:30--15:15	Plenary talk :Prof. Dr. Rüstem KAYA "Generalized Poincare Half-Planes"
15:15--15:30	Coffee Break
15:30--16:30	Sessions 1
16:30--16:45	Coffee Break
16:45--17:45	Sessions 2
June 28, 2022	
09:30--10:30	Session 1
10:30--10:45	Coffee Break
10:45--11:45	Sessions 2
11:45--12:00	Coffee Break
12:00--12:45	Plenary talk: Prof. Dr. Rafael Lopez CAMINO "Some themes around the catenary"
13:00--14:30	Lunch
14:30-15:15	Plenary talk: Prof. Dr. Vitor BALESTRO "Duality of convex distance functions with respect to symplectic forms"
15:15--15:30	Coffee Break
15:30--16:30	Sessions 3
June 29, 2022	
09:30--10:15	Plenary talk: Assoc. Prof. Dr. Muhittin Evren AYDIN "On Pythagorean Immersions"
10:15--10:30	Coffee Break
10:30--11:45	Sessions 1
11:45-12:00	Coffee Break
12:00	Closing Ceremony

June 27, 2022

HALL 1	**10:00-11:00**	**Openning Ceremony**
	11:00 -11:15	**Coffee Break**

Lecture		Invited Speaker	Chairman
HALL 1	**11:15-12:00**	New Horizons on Holditch Theorem **Prof. Dr. Salim YÜCE**	**Prof. Dr. Murat TOSUN**
	12:00-12:15	**Coffee Break**	

Lecture		Invited Speaker	Chairman
HALL 1	**12:15-13:00**	From the Factorization of Motions to the Factorization of Darboux Cyclides **Prof. Dr. Hans- Peter SCHROECKER**	**Prof. Dr. Figen ÖKE**
	13:00-14:30	**Lunch**	

Lecture		Invited Speaker	Chairman
HALL 1	**14:30-15:15**	Generalized Poincare Half-Planes **Prof. Dr. Rüstem KAYA**	**Prof. Dr. Mahmut ERGÜT**
	15:15-15:30	**Coffee Break**	

Lecture		Session	Speakers	Chairman
HALL 2	**SESSION 1**	**15:30-15:45**	Properties of Leonardo Pauli quaternions **Zehra İşbilir, Mahmut Akyiğit, Murat Tosun**	**Prof. Dr. Cihan ÖZGÜR**
		15:45-16:00	Characterization of Tzitz´eica Curves Using Positional Adapted Frame **Kahraman Esen Özen, Zehra İşbilir, Murat Tosun**	
		16:00-16:15	Euler and De Moivre's Formulas for Fundamental Matrices of Elliptic Quaternions **Hidayet Huda Kösal, Kemal Eren, Mahmut Akyiğit**	
		16:15-16:30	On Elliptic Biquaternionic Equations in Field Theory **Zülal Derin Yaqub, Mehmet Ali Güngör**	
		16:30-16:45	**Coffee Break**	

June 27, 2022

Lecture		Session	Speakers	Chairman
HALL 3	SESSION 1	15:30-15:45	A Note on CMC Surface in Minkowski 4-Space **Aykut Kayhan, Nurettin Cenk Turgay**	Prof. Dr. Kazım İLARSLAN
		15:45-16:00	A Note on non-Minimal Hypersurface in Minkowski 5-Space **Aykut Kayhan, Nurettin Cenk Turgay**	
		16:00-16:15	Some Results on Spacelike Mannheim Curves in Minkowski 3-Space **Halil İbrahim Arıcı, Kazım İlarslan**	
		16:15-16:30	Spacelike Bertrand Curves in Minkowski 3-Space **Hatice Altın Erdem, Kazım İlarslan**	
		16:30-16:45	**Coffee Break**	

Link				
Lecture		Session	Speakers	Chairman
HALL 4 (Online)	SESSION 1	15:30-15:45	On curvature computations of intersection curves of two parametric surfaces in E^n **Bedia Merih Özçetin, Mustafa Düldül**	Assoc. Prof. Dr. Mahmut AKYİĞİT
		15:45-16:00	Rytov curves related to the framed curve in 3d space **Zehra Özdemir, Hazal Ceyhan, F. Nejat Ekmekci**	
		16:00-16:15	Constant Angle Surfaces in Euclidean 3-Space **Beyhan Yılmaz, Yusuf Yaylı**	
		16:15-16:30	The Curvatures of Loxodromes on Rotational Surfaces **Ferdağ Kahraman Aksoyak, Burcu Bektaş Demirci, Murat Babaarslan**	
		16:30-16:45	**Coffee Break**	

Link				
Lecture		Session	Speakers	Chairman
HALL 5 (Online)	SESSION 1	15:30-15:45	Some slant helices in R^4_1 **Fatma Bulut**	Assoc. Prof. Dr. Nural YÜKSEL
		15:45-16:00	On the developable ruled surface generated by the curvature axis of a curve **Ferhat Taş**	
		16:00-16:15	Focal Surfaces Of Tubular Surfaces in Modified Orthogonal Frame **Nural Yüksel, Nurdan Oğraş**	
		16:15-16:30	Normal Curves According to the Case 2 Extended Darboux(ED)-Frame in Euclidean 4-Space **Özcan Bektaş**	

16:30-16:45	**Coffee Break**

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Lecture	Session	Speakers	Chairman
HALL 2 SESSION 2	16:45-17:00	Geometry of Coupled Dispersionless Equations with Involute Evolute Curves **Kemal Eren, Soley Ersoy**	Prof. Dr. Mehmet Ali GÜNGÖR
	17:00-17:15	Smooth curves with singular points in three-dimensional Lie groups **Bahar Doğan Yazıcı, Osman Zeki Okuyucu, Murat Tosun**	
	17:15-17:30	Parallel p-equidistant ruled surface of special singular curves **Bahar Doğan Yazıcı, Sıddıka Özkaldı Karakuş, Murat Tosun**	
	17:30-17:45	Eigenvalues and Eigenvectors of Commutative Octonion Matrices **Arzu Sürekçi, Mehmet Ali Güngör**	
	17:45-18:00	Submanifolds with Generalized 1-type Gauss Map **Mustafa Sağdiç, Nurettin Cenk Turgay, Erol Kılıç**	

Lecture	Session	Speakers	Chairman
HALL 3 SESSION 2	16:45-17:00	Pointwise semi-slant Riemannian maps (PSSRM) from almost Hermitian manifolds **Yılmaz Gündüzalp, Mehmet Akif Akyol**	Prof. Dr. F. Nejat EKMEKCİ
	17:00-17:15	Pointwise hemi-slant Riemannian maps (PHSRM) from almost Hermitian manifolds **Mehmet Akif Akyol, Yılmaz Gündüzalp**	
	17:15-17:30	An examination for singularities of the ruled surfaces **Emel Karaca**	
	17:30-17:45	The charged point-particle trajectories via Darboux Frame fields **Hazal Ceyhan, Zehra Özdemir, F. Nejat Ekmekci**	

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Link				
Lecture		Session	Speakers	Chairman
HALL 4 (Online)	SESSION 2	16:45-17:00	On Constant-Ratio Surfaces of Rotation In Euclidean 4-Space **Kadri Arslan, Eray Demirbaş, Betül Bulca**	Assoc. Prof. Dr. Ferdağ KAHRAMAN AKSOYAK
		17:00-17:15	Rotational Self-Shrinkers in Euclidean Spaces **Kadri Arslan, Yılmaz Aydın, Betül Bulca**	
		17:15-17:30	Some Notes on Deformed lifts of 2-jets **Seher Aslancı**	
		17:30-17:45	On the Generalized lp-metric **Harun Barış Çolakoğlu**	

Link				
Lecture		Session	Speakers	Chairman
HALL 5 (Online)	SESSION 2	16:45-17:00	Structure functions of ruled surfaces in the Galilean Space **Duygu Ulaş, Keziban Orbay**	Prof. Dr. Keziban ORBAY
		17:00-17:15	Pseudo-Galilean Magnetic Flux Tubes and Split Semi-Quaternions **O. Oğulcan Tuncer**	
		17:15-17:30	Inequalities on screen conformal half lightlike submanifolds of a Lorentzian manifold with semi-symmetric metric connection **Nergiz (Önen) Poyraz, Burçin Doğan, Erol Yaşar**	
		17:30-17:45	On geometry of semi-invariant lightlike submanifolds of golden semi Riemannian manifolds **Nergiz (Önen) Poyraz, Burçin Doğan**	

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Lecture		Session	Speakers	Chairman
HALL 2	SESSION 1	9:30-9:45	A Note On Beams And Inextensible Flows in Quasi-Sasakian Manifolds **Azime Çetinkaya**	Assoc. Prof. Dr. Mehmet Akif AKYOL
		9:45-10:00	Some results on Epsilon-Kenmotsu manifolds **Gülhan Ayar**	
		10:00-10:15	Biharmonic Curves on Golden Riemannian Manifolds **Gizem Köprülü, Feyza Esra Erdoğan, Bayram Şahin, Fulya Şahin**	
		10:15-10:30	Triharmonic Curves in Complex Space Forms **Gizem Köprülü, Bayram Şahin**	
		10:30-10:45	**Coffee Break**	

Lecture		Session	Speakers	Chairman
HALL 3	SESSION 1	9:30-9:45	Translation surfaces of constant mean curvature in R^3 with respect to semi-symmetric connections **Ayla Erdur Kara, Mahmut Ergüt**	Assoc. Prof. Dr. Muhittin Evren AYDIN
		9:45-10:00	A New Approach to the Fermi-Walker Derivative **Aziz Yazla, Muhammed Talat Sarıaydın**	
		10:00-10:15	Isometries between timelike helicoidal surfaces and rotational surfaces in E^4_1 **Yasin Küçükarıkan, Murat Babaarslan, Burcu Bektaş Demirci**	
		10:15-10:30	Fractional Derivative Approaches on Differential Geometry of Curves **Nursemin Çavdar, Mahmut Ergüt**	
		10:30-10:45	**Coffee Break**	

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Link				
Lecture		**Session**	**Speakers**	**Chairman**
HALL 4 (Online)	**SESSION 1**	**9:30-9:45**	Spherical indicatrix curves of anti-Salkowski curve in 3-dimensional Minkowski space **Nural Yüksel, Esra Damar, Burçin Saltık**	**Assoc. Prof. Dr. Şeyda KILIÇOĞLU**
		9:45-10:00	Ruled surface of the curve generated by a curve with constant torsion **Burçin Saltık, Nural Yüksel, Murat Kemal Karacan**	
		10:00-10:15	Visualizations of Möbius transformations via the Lambert azimuthal projection **Emre Öztürk**	
		10:15-10:30	Invariants of a nonlinear transformation and osculating helix **Emre Öztürk**	
		10:30-10:45	**Coffee Break**	

Link				
Lecture		**Session**	**Speakers**	**Chairman**
HALL 5 (Online)	**SESSION 1**	**9:30-9:45**	A new geometric approach for dual spatial motions through point-line geometry **Derya Kahveci, Yusuf Yaylı, İsmail Gök**	**Prof. Dr. Sıddıka ÖZKALDI KARAKUŞ**
		9:45-10:00	Inversions with Respect to an Ellipse in a Non-Euclidean Geometry **Zeynep Can**	
		10:00-10:15	A Geometric View to Fixed Point Theory on A Metric Space: Fixed Cassini Ovals **Gaye Zaim Erçınar, Temel Ermiş, Özcan Gelişgen**	
		10:15-10:30	Circular and Elliptic Inversions in Taxicab Plane Geometry **Ali Osman Şen, Temel Ermiş**	
		10:30-10:45	**Coffee Break**	

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Lecture		Session	Speakers	Chairman
HALL 2	SESSION 2	10:45-11:00	A second order linear ODE as a space of constant curvature **Ayşe Turhan, Fatma Özcan, Pelin Tekin, Tuna Bayrakdar**	Prof. Dr. Murat Kemal KARACAN
		11:00-11:15	Intrinsic geometry of a linear first-order ODE **Tuna Bayrakdar**	
		11:15-11:30	A Note On Weakly B-Symmetric Space-times **Dilek Kurt, Hülya Bağdatlı Yılmaz**	
		11:30-11:45	On the geometry of second-order tangent bundle with deformed Sasaki metric **Kübra Karaca, Aydın Gezer, Abdullah Mağden**	
		11:45-12:00	Coffee Break	

Lecture		Session	Speakers	Chairman
HALL 3	SESSION 2	10:45-11:00	A Geometric View to Fixed Point Theory on A Metric Space: Fixed Ellipses **Özcan Gelişgen, Temel Ermiş, Gaye Zaim Erçınar**	Assoc. Prof. Dr. Çetin CAMCI
		11:00-11:15	A Geometric View to Fixed Point Theory on A Metric Space: Fixed Hyperbolas **Temel Ermiş, Özcan Gelişgen, Gaye Zaim Erçınar**	
		11:15-11:30	Application of the Principle of Least Action to the Some Special Curve Types Under the Homothetic Motion **Elvan Korkmaz, Serdar Soylu**	
		11:30-11:45	Application of the Principle of Least Action to the Some Special Curve Types Under the Inverse Homothetic Motion **Serdar Soylu, Elvan Korkmaz**	
		11:45-12:00	Coffee Break	

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Link				
Lecture		**Session**	**Speakers**	**Chairman**
HALL 4 (Online)	**SESSION 2**	**10:45-11:00**	Perturbations of Quadratic Polynomials and its Fractals **Figen Çilingir**	**Assoc. Prof. Dr. İlkay GÜVEN ARSLAN**
		11:00-11:15	Cubic polynomial curve as the Bezier curve in E^2 **Şeyda Kılıçoğlu, Süleyman Şenyurt**	
		11:15-11:30	Spherical Bertrand and PH-Curves **Burcu Gür Soğat, Mehmet Gümüş**	
		11:30-11:45	Bicovariant differential calculus on the superalgebra ${\cal O}({\rm GL}_{h,h'}(1\|1))$ **Salih Celik, İlknur Temli**	
		11:45-12:00	**Coffee Break**	

Link				
Lecture		**Session**	**Speakers**	**Chairman**
HALL 5 (Online)	**SESSION 2**	**10:45-11:00**	On f-biminimal Legendre curves in (α,β)-trans-Sasakian generalized Sasakian space forms **Şerife Nur Bozdağ, Selcen Yüksel Perktaş, Feyza Esra Erdoğan**	**Assoc. Prof. Dr. Zehra ÖZDEMİR**
		11:00-11:15	Some Properties of Concircular, Conharmonic and Projective Curvature Tensors on 4-dimensional Lorentzian and Riemannian Spaces **Bahar Kırık Rácz, Cihat Kılınç, Ramazan Toplu**	
		11:15-11:30	Some inequalities on slant Riemannian submersions from cosymplectic space forms **Nergiz (Önen) Poyraz, Mehmet Akif Akyol**	
		11:30-11:45	A study on Golden GCR-lightlike submanifolds of golden semi-Riemannian manifolds **Nergiz (Önen) Poyraz**	
		11:45-12:00	**Coffee Break**	

Lecture		**Invited Speaker**	**Chairman**
HALL 1	**12:00-12:45**	Some themes around the catenary **Prof. Dr. Rafael LOPEZ**	**Prof. Dr. Hans- Peter SCHROECKER**
	13:00-14:30	**Lunch**	

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Link			
Lecture		**Invited Speaker**	**Chairman**
HALL 1	**14:30- 15:15**	Duality of convex distance functions with respect to symplectic forms **Prof. Dr. Vitor BALESTRO**	**Prof. Dr. Rafael LOPEZ**
	15:15-15:30	**Coffee Break**	

Lecture		**Session**	**Speakers**	**Chairman**
HALL 2	**SESSION 3**	**15:30-15:45**	Weierstrass and Björling holomorphic representations of minimal surfaces in simply isotropic space **Luiz C. B. Da Silva**	**Prof. Dr. Özcan GELİŞGEN**
		15:45-16:00	On extrinsically flat surfaces that are ruled: characterization of manifolds of constant curvature by ruled surfaces **Luiz C. B. Da Silva, José D. Da Silva**	
		16:00-16:15	Graph surfaces with constant Gaussian curvature and constant extrinsic curvature in H^2 × R **Uğur Dursun**	
		16:15-16:30	A short note on ρ-Einstein solitons **Sinem Güler**	
		16:30-16:45	**Coffee Break**	

Lecture		**Session**	**Speakers**	**Chairman**
HALL 3	**SESSION 3**	**15:30-15:45**	Legendre curves of Finite Type in R^(2+t)(−3t) Space **Saniye Can, Büşra Bataray, Çetin Camcı**	**Assoc. Prof. Dr. Semra KAYA NURKAN**
		15:45-16:00	Bezier PH-Curves in Euclidean Space **Havva Doğan Altın, Mehmet Gümüş**	
		16:00-16:15	A Note on Vietoris' Polynomials **Nurten Gürses, Duygu Çağlar**	
		16:15-16:30	On Characterizations of Spherical Curves using Frenet Like Curve Frame **Kebire Hilal Ayvacı, Kemal Eren, Süleyman Şenyurt**	
		16:30-16:45	**Coffee Break**	

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Link				
Lecture		**Session**	**Speakers**	**Chairman**
HALL 4 (Online)	**SESSION 3**	**15:30-15:45**	On A Classification Of Generalized Sasakian Space Forms **Tuğba Mert, Mehmet Atçeken , Pakize Uygun**	**Prof. Dr. Mehmet ATÇEKEN**
		15:45-16:00	On (k,μ)-Paracontact Manifolds **Pakize Uygun, Mehmet Atçeken, Tuğba Mert**	
		16:00-16:15	A note on W3 curvature tensor in α-cosymplectic manifolds **Selahattin Beyendi**	
		16:15-16:30	Almost α-cosymplectic manifolds admitting certain vector fields **Mustafa Yıldırım**	
		16:30-16:45	**Coffee Break**	

Link				
Lecture		**Session**	**Speakers**	**Chairman**
HALL 5 (Online)	**SESSION 3**	**15:30-15:45**	Some characterizations on conformal Ricci soliton **Müslüm Aykut Akgün**	**Prof. Dr. Cihan ÖZGÜR**
		15:45-16:00	Sequential Warped Product Manifolds with Gradient Ricci-Harmonic Solitons **Fatma Karaca, Cihan Özgür**	
		16:00-16:15	Shearing Deformations of Hitchin Representations and the Symplectic Structure **Hatice Zeybek**	
		16:15-16:30	Gradient Solitons on Warped-twisted Product Manifolds **Sibel Gerdan Aydın, Hakan Mete Taştan**	

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Lecture		Invited Speaker	Chairman
HALL 1	09:30-10:15	On Pythagorean Immersions **Assoc. Prof. Muhittin Evren AYDIN**	**Prof. Dr. Mahmut ERGÜT**
	10:15-10:30	**Coffee Break**	

Lecture		Session	Speakers	Chairman
HALL 2	SESSION 1	10:30-10:45	On Some Mappings that Transform Helices from E^n to Minkowski Space E_1^n or E_1^{n+1} **Hasan Altınbaş, Mahmut Mak, Bülent Altunkaya, Levent Kula**	**Assoc. Prof. Dr. Murat BABAARSLAN**
		10:45-11:00	Surfaces with Constant Negative Gaussian Curvature in The Simply Isotropic 3-Space **Semra Kaya Nurkan, İbrahim Gürgil, Murat Kemal Karacan**	
		11:00-11:15	Adjoint curve with modified orthogonal frame **Semra Kaya Nurkan, İlkay Arslan Güven**	
		11:15-11:30	Some Singularities in Lorentz 3-space **Esma Demir Çetin, Çağla Ramis**	
		11:30-11:45	Geometry of rational helices and its applications **Fatma Şengüler Çiftçi**	
		11:45-12:00	**Coffee Break**	

Lecture		Session	Speakers	Chairman
HALL 3	SESSION 1	10:30-10:45	Applications of Dual Transformations in Euclidean and Lorentzian Spaces **Gülsüm Yüca, Yusuf Yaylı**	**Assist. Prof. Dr. Temel ERMİŞ**
		10:45-11:00	Kinematics Curves in 3-Dimension Minkowski Space **Betül Sarı, Ümit Ziya Savcı**	
		11:00-11:15	The Study Variety of Conformal Space Kinematics **Bahar Kalkan, Zijia Li, Hans-Peter Schröcker, Johannes Siegele**	
		11:15-11:30	The Interpretation of the Apparent Movement of the Sun Through the Spherical Spiral **Deniz Güçler, F. Nejat Ekmekci**	
		11:30-11:45		
		11:45-12:00	**Coffee Break**	

Invited Speakers

19th International Geometry Symposium
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From the Factorization of Motions to the Factorization of Darboux Cyclides

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Abstract

The factorization of motion polynomials (certain polynomials over quaternion algebras) was introduced roughly a decade ago. It corresponds to the decomposition of rigid body motions (and also motions in other transformation groups) with rational curves as trajectories into the composition of motions of lower degrees. In case of rigid body motions, factorizations with linear factors can be converted into mechanisms that generate the given motion. An essential property that allows for this construction is non-uniqueness of the factorization.

In our talk, we provide an overview of a decade of motion polynomial factorization over diverse quaternionic algebras (Hamiltionian, split, dual, and also some Clifford algebras) and how it helps to synthesize new mechanisms. While fundamental mathematical results in this context are of algebraic nature, there is an underlying geometry that allows to better understand and explain what is actually going on.

There are some very recent results on the much harder factorization of bivariate motion polynomials. They not only give rise to the construction of a new class of mechanisms with two degrees of freedom and very curious motion properties, but are also related to the recent classification of surfaces with two pencils of circles. We illustrate this by demonstrating how certain Darboux cyclides can be factored and why only some of them can be viewed as quaternion product of two circles.

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Generalized Poincaré Half-Planes

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Abstract

In this note, we give some generalisations of the classical Poincaré upper half-plane, which is the most popular model of hyperbolic plane geometry. For this, we replace the circular arcs by elliptical arcs with center on the x−axis, and foci on the x−axis or on the lines perpendicular to the x−axis at the center, in the upper half-plane. Thus, we obtain a class of generalized upper half-planes with infinite number of members.

Furthermore we show that every generalized Poincaré upper half-plane geometry is a neutral geometry satisfying the hyperbolic axiom. That is, it satisfies also all axioms of the Euclidean plane geometry except the parallelism.

Keywords: Metric, Hyperbolic geometry, Hyperbolic distance, Poincaré half-plane, Absolute geometry.
2010 Mathematics Subject Classification: 51F05, 51K05.

References

[1] Anderson, J.W., Hyperbolic Geometry Springer-Verlag, London Berlin Heidelberg (1964).

[2] Birkhoff, G., A Set of Postulates for Plane Geometry, Based on Scale and Protractor, Annals of Math., 33 (1932), 329-345.

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[4] Greenberg, M.J., Euclidean and Non-Euclidean Geometries, Development and History, W.H. Freeman and Company (1993).

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[6] Krause, F.G., Taxicab Geometry, An Adventure in Non-Euclidean Geometry, Dover Publications, Inc., New York (1986).

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Some Themes Around the Catenary

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Abstract

The catenary is the shape of a hanging chain suspended from its endpoints. In this talk, we will give some topics around the catenary curve, such as its extension to higher dimensions and the study of catenaries in other ambient spaces. As a special interest, we focus on the axisymmetric singular minimal surfaces, which are models of domes and roofs. We will discuss if catenary rotation surfaces and paraboloids can be candidates for models of domes.

Keywords: catenary, rotation tectum, paraboloid, center of gravity
2010 Mathematics Subject Classification: 53Z30, 53A10, 68N30

References

[1] R. López, What is the Shape of a Cupola? American Math. (2022) to appear.

[2] R. López, Plateau-Rayleigh instability of singular minimal surfaces. *Comm. Pure. App. Anal.* , (2022), to appear.

[3] R. López, A dome subjected to compression forces: a comparison study between the ideal model, the catenary rotation surface and the paraboloid. Preprint (2022).

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New Horizons on Holditch Theorem

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Abstract

Rev. Hammet Holditch gave the following significiant theorem in 1858, which is still up to date:

If a chord of a closed curve of constant length $c+c'$, be divided into two parts of lengths c, c', respectively, the difference between the areas of the closed curve, and of the locus of the dividing point, will be $\pi c\, c'$, [1].

This theorem attracted great attention of mathematicians in the following years and was proved with different methods. It was even generalized using a variety of techniques.

In this presentation, 6 different proofs of the Holditch Theorem and all its generalizations will be given. In addition, it is aimed to attract the attention of young researchers by providing a detailed literature review on this field along with open problems.

Keywords: Holditch Theorem.
2010 Mathematics Subject Classification: 53A04, 53A05, 53A17.

References

[1] Rev. Hammet Holditch, Geometrical Theorem, *The Quarterly J. Pure Appl. Math.* 2 (1858), 38.

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On Pythagorean Immersions

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Abstract

This talk is based on jointly works with Adela Mihai (Technical University of Civil Engineering Bucharest and Transilvania University of Brasov) and Cihan Ozgur (Izmir Democrasy University), see [3, 1]. A triple (A, B, C) of integer-valued square matrices is called a matrix Pythagorean triple if $A^2 + B^2 = C^2$ (see [2]). This notion is indeed an extension of the Pythagorean triples, one of the most basic notions in Number Theory. By means of Pythagorean Theorem, the Pythagorean triples have a brilliant geometrical interpretation: if the lenghts of the sides of a right triangle are integer then they are a Pythagorean triple. In contrast, the notion of matrix Pythagorean triples is constructed by an algebraic viewpoint. The main goal of the talk is to give a geometrical interpretation for the matrix Pythagorean triples. For this we introduce a new class of submanifolds isometrically immersed into Euclidean spaces that we call Pythagorean submanifolds. These immersions will be defined by an equation in terms of the induced metric tensor field and shape operator. For example; in the particular case of three dimensional, by a Pythagorean surface we mean a surface whose three fundamental forms are a matrix Pythagorean triple. As consequences of this talk, we observe some close relations among the Pythagorean submanifolds, isoparametric submanifolds and minimal submanifolds. Hence a detailed investigation of these submanifolds (including a series of consequences and non-trivial examples) is provided by using the strong results of theory of submanifolds (e.g. [4, 5]).

Keywords: Matrix Pythagorean triple, Pythagorean submanifold, shape operator.
2010 Mathematics Subject Classification: 11C20, 53B25.

References

[1] M. E. Aydin, A. Mihai, C. Ozgur, Pythagorean isoparametric hypersurfaces in Riemannian and Lorentzian space forms, *Axioms* **11** (2022), 59.

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[4] C. L. Terng, Isoparametric submanifolds and their Coxeter groups, *J. Differential Geom.* **21** (1985), 79-107.

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Duality of Convex Distance Functions with respect to Symplectic Forms

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Abstract

In this talk, we investigate the dual convex functions obtained from identifying polar sets of unit balls via a fixed symplectic form (instead of via an inner product). The main consequence of this approach is a characterization of the closed characteristics in the boundary of a convex surface as optimal cases of a certain isoperimetric inequality. Some problems that arise naturally will be also mentioned. This is based in a joint work with Horst Martini and Ralph Teixeira.

Keywords:
2010 Mathematics Subject Classification:

References

Abstracts of Oral Presentations

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Circular and Elliptic Inversions in Taxicab Plane Geometry

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Abstract

In this study, we define the elliptic inversion transformation with respect to a taxicab ellipse, and prove several properties of this new transformation. Later, we introduce the basic geometric properties of the inversion in a taxicab ellipse, which generalizes the inversion with respect to a taxicab circle, from a computational and geometric point of view. In particular, we give a geometrical construction of inverse points with respect to a taxicab ellipse. For this, we generalize the method given in [1] for finding a inverse point with respect to the taxicab circle.

Keywords: Inversion, Taxicab metric, Plane geometry.

2010 Mathematics Subject Classification: 97G50, 40E99, 51F99, 51K99.

References

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Eigenvalues and Eigenvectors of Commutative Octonion Matricesy

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Abstract

In this article, the expression of commutative octonions in terms of idempotent bases is described. Using this definition, algebraic properties for commutative octonions are studied. Then, with the help of these new features, an isomorphism between commutative octonion algebra and matrix algebra is defined. With this isomorphism, a new matrix algebra corresponding to idempotent bases is constructed. Besides, the concepts of eigenvalues and eigenvectors for commutative octonion matrices are reexamined. Finally, a comparison is made between the results obtained and those found in the literature.

Keywords: Commutative octonion, commutative octonion matrix, eigenvalue, eigenvector.
2010 Mathematics Subject Classification: 13A99, 15A18, 15B33.

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A New Approach to Special Curve Pairs with Conformable Derivative

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Abstract

In this study, the best-known curve pairs in Euclidean space are re-characterized with a new approach with the help of the comformable derivative. Curvatures of unit speed curves are re-characterized with the help of a conformable derivative. Finally, the effects of this conformable derivative on the curves are visualized with various examples.

Keywords: Special curve pairs, curvatures, fractional derivative, conformable derivative.
2010 Mathematics Subject Classification: 26A33, 53A04, 53A55.

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A Note on CMC Surface in Minkowski 4-Space

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Abstract

$\phi : M \to N$ is a map between Riemannian manifolds then its energy functional is defined by

$$E(\phi) = \frac{1}{2}\int |d(\phi(x))|^2 dx,$$

where $d(\phi(x))$ denotes the differential of ϕ at $x \in M$ [1]. The tension field of ϕ is defined by

$$\tau(\phi) = div(d\phi) = trace\nabla d\phi$$

is the Euler-Lagrange operator associated with E[2]. ϕ is called harmonic if $\tau(\phi) = 0$. On the other hand, bienergy funtional is defined by

$$E_2(\phi) = \frac{1}{2}\int |\tau(\phi)|^2 v_g$$

where v_g is the volume element. ϕ is said to be biharmonic if it is the critical point of the bienergy. Euler-Lagrange equation for E_2

$$\tau_2(\phi) = \mathbf{J}(\tau(\phi)) = 0,$$

where $\mathbf{J}$ is the Jacobi operator [3]. Caddeo *et al.* introduced the notion of biconservative, i.e., $\tau_2(\phi)^T = 0$ [5].

Let M be a submanifold of a semi-Riemannian manifold N. Then M is biharmonic if the equations

$$m\text{grad}\,\langle H, H\rangle + 4trA_{\nabla^\perp_{(\cdot)}H}(\cdot) + 4tr(\tilde{R}(\cdot, H)\cdot)^T = 0, \tag{1}$$

$$tr\,(h(A_H(\cdot), \cdot)) - \Delta^\perp H + tr(\tilde{R}(\cdot, H)\cdot)^\perp = 0, \tag{2}$$

are satisfied, where H is the mean curvature vector and h, $\nabla^\perp$ denote the second fundamental form and normal connection of M, respectively. Note that when N is a flat space form, (4) and (3) is equivalent to $\Delta H = 0$ (see [1]).

On the other hand M is biconservative if and only if (3) is satified. In this work we study on biconservative surfaces with constant mean curvature vector in Minkowski four space and we abberviate it as biconservative CMC surfaces.

Keywords: CMC surfaces, Biconservative submanifolds.
2010 Mathematics Subject Classification: 53C42 (Primary),53B25

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A Note on non-Minimal Hypersurface in Minkowski 5-Space

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Abstract

Let M be a submanifold of a semi-Riemannian manifold N. Then M is biharmonic if the equations

$$m\text{grad}\,\langle H,H\rangle + 4trA_{\nabla^{\perp}_{(\cdot)}H}(\cdot) + 4tr(\tilde{R}(\cdot,H)\cdot)^{T} = 0, \tag{3}$$

$$tr\,(h(A_H(\cdot),\cdot)) - \Delta^{\perp}H + tr(\tilde{R}(\cdot,H)\cdot)^{\perp} = 0, \tag{4}$$

are satisfied, where H is the mean curvature vector and h, $\nabla^{\perp}$ denote the second fundamental form and normal connection of M, respectively. Biharmonic submanifolds have been attracting the attention of geometers for many year. In particular, after Chen conjectured "*Any biharmonic submanifold in the Euclidean space is minimal*"(see [1]).

On the other hand M is biconservative if and only if (3) is satified. Moreover; if the surface is hypersurface then (3) becomes

$$A(\nabla H) = \epsilon\frac{nH}{2}\nabla H$$

In this work we study on non-minimal biconservative hypersurfaces in $\mathbb{E}^5_1$ and we give counter-example to Chen's conjecture in Minkowski space.
Keywords: CMC surfaces, Biconservative submanifolds.
2010 Mathematics Subject Classification: 53C42 (Primary),53B25

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Translation Surfaces of Constant Mean Curvature in $\mathbb{R}^3$ with respect to Semi–Symmetric Connections

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Abstract

A surface is called a translation surface if it can be locally written as the sum $X(s,t) = \alpha(s)+\beta(t)$ of two space curves $\alpha : I \subset \mathbb{R} \to \mathbb{R}^3$ ve $\beta : J \subset \mathbb{R} \to \mathbb{R}^3$. In the case where α, β are plane curves lying on orthogonal planes, the surface is called a translation surface of planar type. The curves α ve β are called generating curves of translation surfaces. The name of translation surface is because the surface obtained by the translation of α along β. The simplest of translation surfaces are the cylindrical surfaces, which can be formed by translation of any curve parallel to itself, lying on its and intersecting all its generating curves. In 3–dimensional Euclidean space $\mathbb{R}^3$, the translation surfaces can be defined by an explicit equation:

$$z = z(x,y) = f(x) + g(y),$$

where (x,y,z) is the rectangular coordinates of $\mathbb{R}^3$ and $z = f(x)$ and $z = g(y)$ equations of a plane generating curves.

In this talk we classify the translation surfaces with nonzero constant mean curvature according to certain semi–symmetric metric and non–metric connections in $\mathbb{R}^3$. As a result, we obtain that such surfaces are cylinders.

Keywords: Mean curvature, semi–symmmetric connection, translation surface.
2010 Mathematics Subject Classification: First 53A10 Second 53C42, 53C05.

A Second Order Linear ODE as a Space of Constant Curvature

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Abstract

We investigate the curvature properties of a second-order ordinary differential equation (ODE) and show that a linear ODE may define a flat space and a space of constant positive curvature.

Keywords: Ordinary differential equations, Riemannian connection, space of constant curvature
2010 Mathematics Subject Classification: 53B20, 34A26.

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A Note on Beams and Inextensible Flows in Quasi-Sasakian Manifolds

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Abstract

We find the classification of beams and inextensible flows of curves in Quasi-Sasakian manifolds. We mention some results for special type of curves. Also we investigate about inextensible flows of curves in submanifolds of Quasi-Sasakian manifolds. We give examples.
Keywords: Beam, flow, Quasi-Sasakian.
2010 Mathematics Subject Classification: 53C25, 53A04 .

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A New Approach to the Fermi-Walker Derivative

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Abstract

This talk is a presentation of our study on the Fermi-Walker derivative of the vector fields along the spherical indicatrices of a space curve according to the quasi frame. After giving the basic concepts on the Fermi-Walker derivative and parallelism, we obtain some geometric properties of the Fermi-Walker derivative and parallelism according to the quasi frame. Then, we derive the Fermi-Walker derivative on the spherical indicatrices of a space curve according to the quasi frame. Additionally, we give an Appendix in which we present a method about how to solve a homogenous normal linear system of differential equations.
Keywords: Fermi-Walker parallelism, normal linear system, spherical image.
2010 Mathematics Subject Classification: 47S10, 53A04, 57R25.

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Smooth Curves with Singular Points in Three-Dimensional Lie Groups

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Abstract

Our aim in this study is to introduce framed curves, which is a smooth curve with singular points, in three-dimensional Lie groups. First, general Frenet-Serret type formulas are given with the help of a Lie curvature we defined for framed curves. Then, Frenet-type frame and Bishop-type frame of framed curves are given with the help of general frame for framed curves in Lie groups. In the last part, energy equations are given in the unit vector fields defined for framed curves of a moving particle, taking into account the physical structure of Lie groups.

Keywords: Framed curves in Lie groups, Lie curvature, energy.
2010 Mathematics Subject Classification: 22E15, 58K05.

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Parallel p-Equidistant Ruled Surface of Special Singular Curves

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Abstract

In this study, p-equidistant ruled surfaces, one of the parallel equidistant ruled surfaces of singular curves, are introduced. New theorems regarding the relations between the striction curves of parallel p-equidistant ruled surfaces formed by singular curves are given. Then, the definitions of Steiner-type rotation vector and Steiner-type translational vector are given for framed curves, which we consider as singular curves. Some relations are given for the concepts of apex angle and pitch for parallel p-equidistant closed ruled surfaces of framed curves. Finally, an example and figures are given to support the theory.

Keywords: Framed curves, p-equidistant ruled surface, singular points.
2010 Mathematics Subject Classification: 53A04, 53A05, 58K05.

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The Study Variety of Conformal Space Kinematics

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Abstract

In this study, a conformal kinematic point model similar to the well-known Study quadric model [1] of rigid body kinematics was constructed and introduced. We will introduce the Study variety of conformal kinematics as a subvariety in the projective space over the even sub-algebra of Conformal Geometric Algebra (CGA). It generalizes the well-known Study quadric model of rigid body kinematics. We define a four quaternion representation which extends the dual quaternion description of rigid body kinematics. Linear polynomials obtained by factoring [2] conformal motions correspond to straight lines on the Study variety, and they characterize a class of one-parametric conformal motions; simple motions. In particular, we work on straight lines in the Study variety [3].

Keywords: Study variety, simple motions, four-quaternion representation of CGA_+.
2010 Mathematics Subject Classification: 15A66, 15A67.

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Some Properties of Concircular, Conharmonic and Projective Curvature Tensors on 4-dimensional Lorentzian and Riemannian Spaces

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Abstract

We investigate some features of concircular, conharmonic, and projective curvature tensors on 4-dimensional Lorentzian and Riemannian spaces. Using the known holonomy algebras for the metric signatures $(+,+,+,-)$ and $(+,+,+,+)$, we prove some theorems on these tensor fields. In the case of spaces admitting parallel and recurrent vector fields, results are also obtained relating these tensor fields to suitable holonomy types. The eigenbivector structure of these tensor fields is also examined for both metric signatures. The interrelations between the Riemann curvature tensor and the investigated tensor fields are discussed, and some specific examples are also presented.

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Keywords: Concircular curvature tensor, projective curvature tensor, conharmonic curvature tensor, holonomy, space-time.
2020 Mathematics Subject Classification: 53B20, 53C29, 53A45.

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On Curvature Computations of Intersection Curves of Two Parametric Surfaces in $\mathbb{E}^n$

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Abstract

In this study, by computing higher order derivatives for a curve lying on a parametric surface we obtain Frenet apparatus of intersection curve of two parametric surfaces in n-dimensional Euclidean space.

Keywords: Surface-surface intersection, Frenet vectors, curvatures.
2010 Mathematics Subject Classification: 53A05.

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Kinematics Curves in 3-Dimension Minkowski Space

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Abstract

In this study, the image of the curve which is on the surface, on the kinematic surface in 3-dimensional Minkowski space is obtained with the help of quaternions. Then, the relationship between the curvatures of the Darboux frame of this image curve and the curvatures of the curve on the main surface has been examined.
Keywords: Minkowski space, split quaternions, geodesic curvature, normal curvature, geodesic torsion.
2010 Mathematics Subject Classification: 53A35, 53A17, 53B30.

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Constant Angle Surfaces in Euclidean 3-Space

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Abstract

In this study, we investigate the general version of constant angle surfaces and give some characterizations in three dimensional Euclidean space. The difference of the present paper is that a constant angle surface is obtained with respect to any direction. This constant angle surface is the special case of developable ruled surface whose direction is the spherical circle which is the radius is less than the radius of the sphere.

Keywords: Constant angle surface, spherical circle, isophote curve.
2010 Mathematics Subject Classification: 53A04, 53A05.

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Spherical Bertrand and PH-Curves

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Abstract

The theory of curves is one of the most important studies in differantial geometry. Especialy Bertrand curves are highly common. The linearity of the principal normal vector fields of any two curves is an interesting problem and this problem was solved by Bertrand in 1850 [1]. Many papers on Bertrand curves have been puplished up to now. In 1990 PH-curves were defined by Farouki and Sakkalis [4] . Izumiya and Takeuchi showed in [3] a method how to get Bertrand curves from an arbitrary spherical curve. In this study we state the latest studies on Bertrand and PH-curves for example [4], [5]. Also we give some results on Bertrand PH-curves in Euclidean and Minkowski spaces.

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Keywords: Bertrand curve, PH-curve, Bertrand PH-curve, Minkowski space.
2010 Mathematics Subject Classification: 53A04, 53A35.

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Ruled Surface of the Curve Generated by a Curve with Constant Torsion

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Abstract

In this work, we study on the ruled surfaces based on the curve $\overline{\alpha}$ generated by a curve with constant torsion. The Gaussian curvature and the mean curvature of this surface are determined. It is seen that the surface could be developable. We examine the distribution parameter of this surface. Some results are given by determining the normal and binormal surfaces of the curve $\overline{\alpha}$ related to the distribution parameters of this surfaces.

Keywords: Ruled surface, constant torsion, developable ruled surface.
2010 Mathematics Subject Classification: 53A04, 53A05.

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The Interpretation of the Apparent Movement of the Sun through the Spherical Spiral

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Abstract

In this paper, it is shown that the union of the daily and yearly apparent movement of the Sun, traces a spherical spiral in a limited section of the sphere. The rotation operator that produces the curve is in turn produced by a quaternion. The way the components of the quaternion correspond to the daily apparent movement of the Sun is shown. The quaternion rotation angle converted in time units displays the time the Sun needs to move from one point to another. The rotational axis for small angles is the same as the axis of the equatorial plane. This study aims to show that the motion of an object under two different centripetal forces, where each makes it possible for the body to move in a uniform circular motion, can be expressed using the spherical spiral formula or the developed spherical spiral formula.

Keywords: spherical spiral, quaternions, apparent movement of the Sun, rotational motion
2010 Mathematics Subject Classification: 15A33, 53A04, 70F05, 70F15.

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A New Geometric Approach for Dual Spatial Motions through Point-Line Geometry

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Abstract

In point-line geometry, a point-line consists of an oriented line and an endpoint on the line, and a point-line displacement is described through screw systems. This study investigates variations of the dual spatial motions, their applications to the point-line geometry, and their representations as quaternions. Furthermore, point-line operator, which consists of a screw and a translation, is obtained. Finally, the connection between the point-line operator and the dual spatial motions is examined.

Keywords: Screw motions, point-line geometry, dual Lie groups.
2020 Mathematics Subject Classification: 15B30, 22E60, 70E17.

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A Note On Weakly B-Symmetric Space-times

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Abstract

We deal with weakly B-symmetric space-times. We prove that a weakly B-symmetric space-time is a quasi Einstein space-time. We investigate $(WBS)_4$ space-times under some special conditions. Moreover, we examine a perfect fluid $(WBS)_4$ space-time, a pressureless fluid $(WBS)_4$ space-time, a radiation fluid $(WBS)_4$ space-time and a viscous fluid $(WBS)_4$ space-time, and we prove some theorems about them.

Keywords: B-tensor, Weakly B-symmetric space-time, Einstein's field equation.
2010 Mathematics Subject Classification: 53C15, 53C25.

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Structure Functions of Ruled Surfaces in the Galilean Space G3

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Abstract

In this study, the structure functions used to characterize a ruled surface in Galilean space are calculated by obtaining the Frenet equations of a unit-speed curve on the Galilean unit sphere in 3-dimensional Galilean space.

Keywords: : Galilean space, spherical curve, structure functions.
2010 Mathematics Subject Classification: 53A35, 53A55.

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Application of the Principle of Least Action to the Some Special Curve Types Under the Homothetic Motion

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Abstract

Special cycloid-type curves are expressed under closed planar homothetic motion and the principle of least action is applied to these curves. The principle of least action is applied to these curves and the energies of the points of the moving plane are calculated in order to calculate the minimum action point of these curves.

Keywords: Planar Homothetic Motion, Cycloid Type Curves, Principle of Least Action.
2020 Mathematics Subject Classification: 53A17, 53A99.

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An Examination for Singularities of the Ruled Surfaces

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Abstract

The natural lift curve, acquired by the endpoints of the unit tangent vectors of the main curve, was first introduced in [3] as below:
for the smooth curve Γ, $\bar{\Gamma}$ is called the natural lift curve of Γ on $T\bar{M}$, which has the following parametric expression according to the arc-length u:

$$\bar{\Gamma}(u) = (\bar{q}(u), \bar{\vartheta}(u)) = (q^{'}(u)|_{\gamma(u)}, \vartheta^{'}(u)|_{\vartheta(u)}), \tag{5}$$

where $\bar{q}$ and $\bar{\vartheta}$ are the derivatives of q and ϑ, respectively.In this study, firstly, we represent the ruled surface generated by the natural lift curve in $\mathbb{R}^3$ by exploitting the isomorphism between unit dual sphere, DS^2 and the subset of the tangent bundle of unit 2-sphere, $T\bar{M}$. Secondly, we examine the singularities of this ruled surface in terms of RM vectors. Additionally, we classify these ruled surfaces.

Keywords: Natural lift, ruled surface, RM vectors.
2010 Mathematics Subject Classification: 21A04, 11R52.

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Invariants of a Nonlinear Transformation and Osculating Helix

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Abstract

In [3], we defined a nonlinear transformation between space curves which preserves the ratio of τ/κ of the given curve in 3−dimensional Euclidean space $\mathbb{E}^3$. In the present study, we investigate some special curves that remains invariant under this transformation and we give the conditions for them. Finally, we examine osculating helix of given curve under certain cases.

Keywords: Nonlinear transformation, helix, osculating helix.

2020 Mathematics Subject Classification: 14H45, 53A04, 97G50

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Visualizations of Möbius Transformations via the Lambert Azimuthal Projection

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Abstract

In this paper, we introduce fixed set points of Möbius transformations and Lambert azimuthal projection with a proof. Then, on unit sphere, we obtain some surfaces (patches of sphere) by means of projection, translations, and rotations.

Keywords: Möbius transformation, Lambert azimuthal projection, patch of sphere.

2020 Mathematics Subject Classification: 54H15, 47A46, 53A05

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Some Singularities in Lorentz 3-Space

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Abstract

Izumiya and Takeuchi studied singularities of the rectifying developable of a space curve in Euclidean 3-space. Moreover they obtained some characterizations by the locus of the end points of modified Darboux vectors of the curve. In this work, we give some singularity theorems in Lorentz 3-space and we search for the necessary conditions for geodesics of the rectifying developable surface.

Keywords: Singular points, developable surfaces.
2010 Mathematics Subject Classification: 53A35, 53A40, 14H50.

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Some Slant Helices in $\mathbb{R}_1^4$

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Abstract

Vector fields have always been used for studying differential geometry of curves not only in 3-space but also in higher dimensional spaces. Darboux vector field plays an important role for space curves in Euclidean 4-space $\mathbb{R}_1^4$. In this paper, we define some slant helices according to frame which play the role of special Darboux vector in Euclidean 4-space.

Keywords: Slant helix, vector field, Frenet curve.
2010 Mathematics Subject Classification: 53A07, 53A35.

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Sequential Warped Product Manifolds with Gradient Ricci-Harmonic Solitons

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Abstract

We study gradient Ricci-harmonic solitons on sequential warped product manifolds. We obtain relationships for sequential warped product manifolds to be a gradient Ricci-harmonic soliton. We give some physical applications for this kind of solitons.

Keywords: Gradient Ricci-harmonic soliton, warped product, sequential warped product.
2010 Mathematics Subject Classification: 53C21, 53C50.

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Parallel Transport in G^3

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Abstract

In this study, Fermi−Walker derivative, Fermi−Walker transport and non−rotating frame concepts have been introduced in G^3 with left invariant metric. Fermi-Walker transport's geometrical description are given in G^3. Being non−rotating frame conditions are analyzed in G^3 with left invariant metric. We have generalized the results known for the case of 3−dimensional Lie group with bi-invariant metric.

Keywords: Fermi−Walker derivative, Fermi−Walker transport, G^3 with left invariant metric.
2010 Mathematics Subject Classification: 53A04, 53A05, 22E15.

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Geometry of Rational Helices and its Applications

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Abstract

The present paper gives an algorithm for constructing rational Pythagorean-hodograph helices (i.e. rational helices), and a proof of that for rational helices with unit tangent vector field of degree 2 no rational rotational minimizing frames exist. There are three applications for these subclass curves of rational Pythagorean-hodograph space curves: C^1 *Hermite interpolation* (i.e. interpolation of end points with associated unit tangents), rational and approximate rotational minimizing frames on rational helices and a rational sweep surface modelling have been discussed.

Keywords: Pythagorean-hodograph curves, rational helices, rotation minimizing frames, geometric C1 Hermite interpolation.
2010 Mathematics Subject Classification: 53A04, 65D05, 65D17, 65D18, 68U07.

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The Curvatures of Loxodromes on Rotational Surfaces

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Abstract

In this paper, we compute the curvatures of loxodromes on rotational surfaces in Euclidean 3-Space. After then we obtain various characterizations for loxodromes on rotational surface having some special geometric properties. Also, we give some examples for results via Wolfram Mathematica.

Keywords: Loxodrome, curvature, torsion, rotational surface.
2010 Mathematics Subject Classification: 53A04, 53A05.

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On the Developable Ruled Surface Generated by the Curvature Axis of a Curve

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Abstract

In this study, we draw ruled surfaces whose generators are the curvature axis of curves. We show that this type of ruled surface is a developable surface. Moreover, we show that there is at least one curve whose curvature axis is a line of the given developable surface.

Keywords: Developable surface, curvature axis.
2010 Mathematics Subject Classification: 51M30, 53A04.

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Perturbations of Quadratic Polynomials and its Fractals

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Abstract

Singular perturbations happen when a pole is introduced into the dynamics of a polynomial. These are rational maps of the form $F_A(z) = P_c(z) + A/z^d$ where P_c is the well-known Mandelbrot set polynomial, c and A are complex valued parameters, and d positive integers.

Our aim in this talk is to describe the dynamical behavior of singular perturbations of complex dynamical systems. The dynamics of the family of those rational functions F_A is explored even if A is chosen to be sufficiently small. For example, the simplest possible case starts with the map $z \to z^2$ and adds a pole at the origin is obtained the families $F_A(z) = z^2 + A/z$ where F_A has a superattracting n-cycle and the Julia set of F_A, $J(F_A)$ is a Sierpinski curve. We shall pay a specific attention to major differences in dynamics of maps chosen small enough of the parameter A and also for different values of the positive integer d.

Keywords: Julia Sets, Rational Iterations, Complex Dynamics.

Mathematics Subject Classification: 37F10, 37F45.

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A Geometric View to Fixed Point Theory on A Metric Space: Fixed Cassini Ovals

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Abstract

Classical fixed-point studies usually focus on determining the necessary and sufficient conditions for a self-mapping to have a unique fixed point. But the set of fixed points of a self-mapping may has more than one point. Thus, a meaningful question arises: "What are the geometric properties of the set of fixed points of such self mappings?(See for more detail [2, 1]).

In this study, we give some theorems which explain existence and uniqueness conditions for fixed Cassini ovals of self-mappings on a metric space together geometric interpretation. So, we will provide a geometrical perspective to the classical metric fixed point theory. Also we support our theoretical results with some illustrative extraordinary examples (See for more detail [3]).

Keywords: Fixed Circle Theory, Fixed Cassini Oval Theory.

2010 Mathematics Subject Classification: 47H10, 37E10, 54H25, 55M20.

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Triharmonic Curves in Complex Space Forms

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Abstract

Harmonic maps between Riemannian manifolds are the critical points of the energy functional and they are therefore the solutions of the corresponding Euler-Lagrange equation. On the other hand, the biharmonic maps are the critical points of the bi-energy functional. There have been a rich literature on biharmonic maps like as harmonic maps. In 1989, S. B. Wang [8] studied the first variational formula of the tri-energy E_3. The critical points are called triharmonic maps. Then, triharmonic curves with constant curvature in space forms were studied by Maeta in [6]. The aim of this paper is to study triharmonic curves in complex space forms. Then, we obtained necessary and sufficient conditions for the Frenet curves to be triharmonic in complex space forms.

Keywords: Riemannian manifold, complex space form, triharmonic curve.
2010 Mathematics Subject Classification: 53C15, 53B20, 53C43.

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Biharmonic Curves on Golden Riemannian Manifolds

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Abstract

Harmonic maps between Riemannian manifolds are the critical points of the energy functional and they are therefore the solutions of the corresponding Euler-Lagrange equation. On the other hand, the biharmonic maps are the critical points of the bi-energy functional. There have been a rich literature on biharmonic maps like as harmonic maps. The purpose of this paper is to study Frenet curves on golden Riemannian manifolds. We investigate necessary and sufficient conditions to be harmonic and biharmonic for Frenet curves on golden Riemannian manifolds. We obtain several results with certain restrictions on curvatures.

Keywords: Riemannian manifold, golden Riemannian manifold, biharmonic curve.
2010 Mathematics Subject Classification: 53C15, 53B20, 53C43.

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Some Results on ϵ-Kenmotsu Manifolds

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Abstract

The object of the paper is to study some new results on an ϵ-Kenmotsu manifold with generalized Tanaka-Webster connection. Also, we obtain the conditions for the concircular curvature tensor of an ϵ-Kenmotsu manifold with generalized Tanaka-Webster connection to be flatness, ξ-concircularly flatness, ϕ-concircularly flatness, pseudo-concircularly flatness and ϕ-concircularly semisymmetry. Finally, we give an example of a 5-dimensional ϵ-Kenmotsu manifold with respect to the generalized Tanaka-Webster connection.

Keywords: ϵ -Kenmotsu manifold, Tanaka-Webster connection.
2010 Mathematics Subject Classification: 53C05, 53D15, 53C25.

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Applications of Dual Transformations in Euclidean and Lorentzian Spaces

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Abstract

Dual transformations are defined in Euclidean and Lorentzian spaces by Dohi et al. [8]. In this study, firstly, we examine the dual transformations by using quaternions. Next, we obtain hyper-dual semi-orthogonal matrices in Lorentzian space from hyper-dual orthogonal matrices in Euclidean space with the help of dual transformations. Then, we give their geometric applications in real and dual spaces. Finally, we provide examples to reinforce these applications.

Keywords: Dual transformation, Lorentzian space, kinematics, quaternions, hyper-dual numbers.
2010 Mathematics Subject Classification: 53A35, 70E17, 70B10.

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Some Results on Spacelike Mannheim Curves in Minkowski 3-Space

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Abstract

In the theory of curves in Euclidean 3-space, it is well known that a curve $\beta : I \to \mathbb{E}^3$ with non-zero curvatures is said to be a Mannheim curve if there is a curve $\beta^\star : I^\star \to \mathbb{E}^3$ such that the principal normal vectors of $\beta(s)$ coincide with the binormal vectors of $\beta^\star(s^\star)$ at $s \in I$, $s^* \in I^*$. These curve have been studied in different space over a long period of time and found wide application in different areas. Therefore, we have a great knowledge of the geometric properties of these curves. In [3], Mannheim partner curves were studied 3-dimensional space. This point of view was also carried to curves in Minkowski 3-space [1, 2]. In [4] ,the authours gave a new approach to Mannheim curves. Thanks to this new approach, new Mannheim curve examples, which are not known in the literature, are obtained and new results are given. In this talk, spacelike Mannheim curves are reconsidered from the perspective of this new approach. The new results obtained were supported with examples.

Keywords: Mannheim curves, timelike curves, spacelike curves, Cartan null curves.

2010 Mathematics Subject Classification: 53C40, 53C50.

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On Some Mappings that Transform Helices from E^n to Minkowski Space E_1^n or E_1^{n+1}

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Abstract

We present mappings that transform helices in Euclidean n-space to non-null helices in Minkowski n-space or Minkowski $(n+1)$-space. We also show that the axes of the helices are preserved by these mappings. We give some examples of non-null helices constructed in Minkowski 3-space or Minkowski 4-space from certain helices in Euclidean 3-space by using these mappings.
Keywords: Helix, invariants, mapping.
2010 Mathematics Subject Classification: 53A04, 53A05, 53B30, 53C25.

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Spacelike Bertrand Curves in Minkowski 3-Space

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Abstract

In the theory of curves in Euclidean 3-space, it is well known that a curve β is said to be a Bertrand curve if for another curve β^*, there exists a one-to-one correspondence between β and β^* such that both curves have common principle normal line. These curve have been studied in different space over a long period of time and found wide application in different areas. Therefore, we have a great knowledge of the geometric properties of these curves. In [3], the authours gave a new perspective to Bertrand curves. This point of view was also carried to curves in Minkowski 3-space [1, 2]. In [4] , new results for spacelike bertrand curves was gave in the light of recent studies on Bertrand curves. In this talk, revested results for spacelike Bertarnd curves will be given with the previous studies on Bertrand curves and related examples that meet these results will be given.

Keywords: Bertrand curves, timelike curves, spacelike curves, Cartan null curves.

2010 Mathematics Subject Classification: 53C40, 53C50.

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Shearing Deformations of Hitchin Representations and the Symplectic Structure

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Abstract

The Hitchin component $\mathrm{Hit}_n(S)$ of a closed surface S is a preferred component of the character variety $\mathcal{X}_{\mathrm{PSL}_n(\mathbb{R})}(S)$ consisting of homomorphisms from the fundamental group $\pi_1(S)$ to the Lie group $\mathrm{PSL}_n(\mathbb{R})$. When $n = 2$, the Hitchin component is just the Teichmüller component of $\mathcal{X}_{\mathrm{PSL}_2(\mathbb{R})}(S)$. In the general case the elements of the Hitchin component $\mathrm{Hit}_n(S)$, similarly enjoy many powerful geometric properties from a variety of viewpoints, involving differential geometry, dynamical systems or the theory of Lie groups. In this study, we compute the pairing of two infinitesimal shearing deformations under the Atiyah-Bott-Goldman symplectic form.

Keywords: Shearing deformations, Hitchin representations, Atiyah-Bott-Goldman symplectic form.
2010 Mathematics Subject Classification: 20H10.

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Bezier PH-Curves in Euclidean Space

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Abstract

Polynomial curves are a family of curves that are frequently used in computer, robotics, design, navigation and many fields [1]. Among these curves, PH-curves and Bezier curves are very important because they are used in computer graphics, computer aided graphic design and related fields. Bezier curves and surfaces were first developed independently between 1958 and 1960 by French engineer Pierre Etienne Bezier and French mathematician Paul de Faget De Casteljau with different mathematical approaches [2],[3]. On the other hand, Farouki and Sakkalis(1990) defined Pythagorean-hodograph curves and gave the characterization for planar PH curves [4]. In this study, we consider these two curves together in Euclidean space, and describe the characterization of these Bézier curves in order to be a PH-curve.

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Keywords: PH-curve, Bezier Curve, Euclidean Space.
2010 Mathematics Subject Classification: 53A04, 53A20.

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The Charged Point-Particle Trajectories via Darboux Frame Fields

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Abstract

In this study, the behavior of a linearly-polarized light wave in optical fiber and the rotation of the polarization plane through Darboux frame fields via Berry's phase equations in Euclidean 3-space is investigated. We research in detail the motion of the polarization plane, and realizations of the geometric phase, using the Darboux frame fields. Moreover, we examine the rotation of the polarization plane of a light wawe with Fermi-Walker parallel transportation rule. Furthermore, we visualize some motivated examples to support the theoretical results in the article using the MAPLE program.

Keywords: Applications to physics, Vector fields, Magnetic flows, Ordinary differential equations,Darboux frame, Magnetic theory .
2010 Mathematics Subject Classification: 53Z04, 53B50, 37C10, 14H45, 14H50, 35A15, 70E17.

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On the Generalized l_p-Metric

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Abstract

In this talk, we give a generalization for the l_p-metric family in n-dimensional space. Then we determine circles of three special cases of this family, which generalize the taxicab, Euclidean and maximum metrics respectively. Finally we give some properties of these circles in the real plane.

Keywords: l_p-metric, taxicab distance, Euclidean distance, maximum distance.
2010 Mathematics Subject Classification: 51K05, 51K99, 51N20.

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Euler and De Moivre's Formulas for Fundamental Matrices of Elliptic Quaternions

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Abstract

In this study, Euler and De-Moivre's formulas for elliptic quaternions are obtained. A simple and effective methods is provided to find the powers and roots of elliptic quaternions with the help of De Moivre's formula obtained from the elliptic quaternions. Moreover, our results are supported by pseudo-codes and some examples.

Keywords: Elliptic Quaternions, Euler and De-Moivre Formulas.
2010 Mathematics Subject Classification: 11R52 ; 15A24; 17A35.

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H-semi-symmetric IK-normal Complex Contact Metric Manifolds

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Abstract

An IK-normal complex contact metric manifold is a subclass of complex contact manifolds. The important property of such manifolds is being Kähler of the structure. H-symmetry conditions have been defined on any Kähler manifolds. In this study, we apply some special H-semi-symmetry conditions to the IK-normal complex contact metric manifolds.

Keywords: Kähler manifold, complex contact manifold, H-symmetry
2010 Mathematics Subject Classification: 53C15, 53C25, 53D10

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On Constant-Ratio Surfaces of Rotation In Euclidean 4-Space

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Position vector field of a submanifold plays important roles in physics and mathematics. Recently, many works have been done with the decomposition of the position vector field into tangential and normal compo- nents. In addition, if the ratio of the lengths of these component is constant then the submanifolds are called constant-ratio type. B. Y. Chen classied the constant- ratio planar curves. In the present study we consider three types of rotational surfaces in E4 We have shown that if the first two types of rota- tional surfaces of E4 are of constant-ratio then their profile curves are open portions one of the plane curves in Chen's classification Theorem. However, if the profile curve is a space curve, some results about constant-ratio surfaces are obtained. We also give some examples to support these results. In conclu- sion, we have a strong feeling that the results obtained in this study can also be applied to rotational submanifolds in E5 for the future work.

Keywords: Surface of rotation, Rotation vector field, Constant-ratio submanifold

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Rotational Self-Shrinkers in Euclidean Spaces

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The rotational embedded submanifold of E(n+d) first studied by N. Kuiper. The special examples of this type are generalized Beltrami submanifolds and toroidals submanifold. The special examples of this type are generalized Beltrami submanifolds and toroidals submanifold. The second named authour and at. all recently have considered 3-dimensional rotational embedded submanifolds in E5. They gave some basic curvature properties of this type of submaifolds. Self-similar flows emerge as a special solution to the mean curvature ow that preserves the shape of the evolving submanifold. In this article we consider self-smilar submanifolds in Euclidean spaces. We obtained some results related with self-shrinking rotational submanifolds in Euclidean 5-space E5: Moreover, we give the necessary and sufficient conditions for these type of submanifolds to be homotheotic solitons for their mean curvature flows. Keywords: Rotational submanifold, Mean curvature flow, Homotechic soliton, self-shrinkers

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Characterization of Tzitzéica Curves Using Positional Adapted Frame

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Abstract

Positional Adapted Frame (PAF) is a new moving frame which is a convenient tool to study the kinematics of a moving point particle with non-vanishing angular momentum in Euclidean 3-space and to study the differential geometry of its trajectory. Tzitzéica curves in Euclidean 3-space are special space curves which were introduced by Georges Tzitzéica in 1911 [15]. PAF is well defined if the trajectory of the moving point particle is a Tzitzéica curve. On the other hand, the class of spherical curves has an important place in differential geometry. Since the tangent line of a spherical curve never passes through the origin, if the trajectory of the moving particle is a spherical curve, PAF is well defined just like in the case of Tzitzéica curves. In this study, Tzitzéica curves are taken into consideration in the Euclidean 3-space by using the Positional Adapted Frame (PAF). Such curves are characterized according to PAF elements. Also, some results are obtained on spherical Tzitzéica curves. The results obtained in this study are new contributions to the field. It is expected that these results will be useful in various application areas of differential geometry and applied mathematics in the future.

Keywords: Kinematics of a particle, Positional Adapted Frame, Tzitzéica curves, differential equations.
2020 Mathematics Subject Classification: 70B05, 57R25, 53A04.

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On Characterizations of Spherical Curves Using Frenet Like Curve Frame

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Abstract

In this study, the explicit characterization of spherical curves in Euclidean 3-space is investigated using the Flc (Frenet like curve) frame. Firstly, the curvature the axis and the osculating sphere of a polynomial space curve are calculated using Flc frame invariants. It is then shown that the curvature the axis is on a straight line. The position vector of a spherical curve is expressed with curvatures connected to the Flc frame. Finally, a differential equation is obtained from the third order, which characterized a spherical curve.

Keywords: Flc frame, Polynomial curves, Spherical curve, Curvature the axis, Osculating sphere.
2010 Mathematics Subject Classification: 53A04, 39A06.

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Geometry of Coupled Dispersionless Equations with Involute Evolute Curves

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Abstract

In this study, we obtain the coupled dispersionless equation from the motion of the involute evolute curve pairs in order to provide a convenient interpretation of the relation with the integrability conditions. In this regard, we find the Lax pair which provides the integrability of this equation and prove that the conserved quantity of this equation is constant.

Keywords: Involute evolute curve, coupled dispersionless equations, Lax pairs, space curve family.
2010 Mathematics Subject Classification: 53A04, 14H70.

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On the Geometry of Second-Order Tangent Bundle with Deformed Sasaki Metric

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Abstract

In this paper we investigate some geometric properties on the second-order tangent bundle T^2M with the deformed Sasaki metric $\overline{g}$ over a Riemannian manifold. All Riemannian curvature tensor fields are calculated. Also, we obtain the necessary and sufficient conditions for $(T^2M, \overline{g})$ to be a Einstein manifold. Finally, we search weakly symmetry property of the second-order tangent bundle equipped with the deformed Sasaki metric.

Keywords: Second-order tangent bundle, deformed Sasaki metric, curvature tensor field.
2010 Mathematics Subject Classification: 53C07, 53A45.

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Weierstrass and Björling Holomorphic Representations of Minimal Surfaces in Simply Isotropic Space

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Abstract

It is well-known that minimal surfaces in Euclidean space can be represented in terms of holomorphic functions. For example, we have the Weierstrass representation [1], where part of the holomorphic data is chosen to be the stereographic projection of the normal of the corresponding surface, and also the Björling representation [4], where it is prescribed a curve on the surface and the unit normal on this curve. In this work, we are interested in the holomorphic representation of minimal surfaces in simply isotropic space, a three-dimensional space equipped with a rank 2 metric of index zero [5]. Since the isotropic metric is degenerate, a surface normal cannot be unequivocally defined based on metric properties only, which leads to distinct definitions of an isotropic normal. Here, we will be interested in two choices, the so-called minimal and parabolic normals [3], As a consequence, the multiple options for an isotropic normal lead to distinct forms of a Weierstrass and of a Björling representation. Here, we show how to represent simply isotropic minimal surfaces in accordance with the choice of an isotropic surface normal [2].

Keywords: Simply isotropic space, holomorphic representation, minimal surface.
2010 Mathematics Subject Classification: 53A10, 53A35, 53C42.

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On Extrinsically Flat Surfaces that are Ruled: Characterization of Manifolds of Constant Curvature by Ruled Surfaces

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Abstract

Special classes of surfaces play a fundamental role in geometry. One such class is given by *ruled surfaces*, i.e., surfaces foliated by a 1-parameter family of geodesics. Here, we investigate ruled surfaces in 3d Riemannian manifolds. For manifolds of constant curvature, we first provide a model-independent proof for the known fact that extrinsically flat surfaces in space forms are ruled [1], see, e.g., [2, 3, 4, 5] for model-dependent proofs. This allows us to identify the necessary and sufficient condition the curvature tensor must satisfy for an extrinsically flat surface in a 3d manifold to be ruled [1]: namely, $R_{trrn} = 0$, where n refers to the direction normal to the surface, r refers to the direction of the rulings, and t refers to the remaining tangent direction. Using this characterization, we can finally establish our main result [1]: if a 3d connected manifold has an extrinsically flat surface tangent to any 2d plane and if they are all ruled surfaces, then the manifold must have constant curvature. Finally, as an application, we prove that there must exist extrinsically flat surfaces in the Riemannian product of the hyperbolic plane, or sphere, with the reals and that do not make a constant angle with the real direction [1].

Keywords: Ruled surface, space form, flat surface, extrinsically flat surface, constant angle surface.
2010 Mathematics Subject Classification: 53A05, 53A35, 53B20, 53C42.

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Pointwise Hemi-Slant Riemannian Maps (PHSRM) from almost Hermitian Manifolds

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Abstract

In this study, we define and study a new class of Riemannian maps which is called *pointwise hemi-slant Riemannian maps (PHSRM)* from an almost Hermitian manifold onto a Riemannian manifold as a generalization of slant submanifolds, slant submersions, slant Riemannian maps, semi-slant submanifolds, hemi-slant submanifolds, semi-slant submersions, hemi-slant submersions, semi-slant Riemannian maps, hemi-slant Riemannian maps, pointwise slant Riemannian maps and pointwise semi-slant Riemannian maps. We illustrate some examples and investigate the geometry of total space, base space and the fibres.

Keywords: Riemannian map, hemi-slant Riemannian map, semi-slant Riemannian map, pointwise semi-slant Riemannian map, pointwise slant Riemannian map.
2010 Mathematics Subject Classification: 53C15, 53B20.

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Submanifolds with Generalized 1-type Gauss Map

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Abstract

A submanifold M of a Euclidean space $\mathbb{E}^n$ is said to have '*pointwise 1-type*' Gauss map if the equation

$$\Delta G = f(G + C) \tag{6}$$

is satisfied for a smooth function f and a constant vector C. Submanifolds in Euclidean spaces with pointwise 1-type Gauss map were recently studied in [1, 2, 3, 4, 5]. Recent studies have shown that the Gauss map of some hypersurfaces of Euclidean spaces satisfies the equation

$$\Delta G = f_1 G + f_2 C \tag{7}$$

for some smooth functions f_1 and f_2. A submanifold is said to have '*generalized 1-type*' Gauss map if its Gauss map satisfies the condition (2), [6]. After this definition was given, hypersurfaces of pseudo-Euclidean spaces have been considered in terms of having generalized 1-type Gauss map, [7, 8, 9].

In this work, we consider rotational surfaces in the Euclidean 4-space $\mathbb{E}^4$ with the profile curve contained in a 2-plane. We obtain some classification results of such surfaces in terms of having generalized 1-type Gauss map.

Keywords: Generalized 1-type Gauss map, General rotational surfaces, Euclidean spaces.
2020 Mathematics Subject Classification: 53B25

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Almost α-Cosymplectic Manifolds Admitting Certain Vector Fields

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Abstract

In the present paper, we characterize almost α-cosymplectic manifolds admitting holomorphically planar conformal vector (HPCV) fields. We have shown that if an almost α-cosymplectic manifold admits a non-zero HPCV field V such that V is pointwise collinear with ξ then the integral manifold of the distribution D is totally geodesic or totally umbilic.

Keywords: Holomorphically planar conformal vector field, almost $\alpha-$cosymplectic manifold
2010 Mathematics Subject Classification: 53C25, 53D10.

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Some Characterizations on Conformal Ricci Soliton

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Abstract

A Ricci soliton (g, V, λ) on a Riemannian manifold (M, g) is a generalization of an Einstein metric such that

$$\pounds_V g + 2S + 2\lambda g = 0 \tag{8}$$

where S is the Ricci tensor, $\pounds_V$ is the Lie derivative operator along the vector field V on M and λ is a real number. The Ricci soliton is said to be shrinking, steady or expanding according to λ being negative, zero or positive, respectively

The concept of conformal Ricci flow [3] was developed by Fischer during 2003-2004 which is a variation of the classical Ricci flow equation that modifies the unit volume constraint of that equation to a scalar curvature constraint. The conformal Ricci flow on M is defined by the equation [3]

$$\frac{\partial g}{\partial t} + 2(S + \frac{g}{n}) = -pg \tag{9}$$

and $r(g) = -1$, where M is considered as a smooth closed connected oriented $n-$manifold, p is a scalar non-dynamical field (time dependent scalar field), $r(g)$ is the scalar curvature of the manifold and n is the dimension of manifold.

In this paper, we examine some results for conformal Ricci soliton on a 3-dimensional manifold satisfying some private conditions.

https://geometrysymposium.org/management/user/login/.

Keywords: Ricci soliton, conformal Ricci soliton, almost contact metric manifold.
2010 Mathematics Subject Classification: 53A40; 53D10.

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Inequalities on Screen Conformal Half Lightlike Submanifolds of a Lorentzian Manifold with Semi-Symmetric Metric Connection

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Abstract

In this paper, we set basic inequalities for screen conformal half lightlike submanifolds of a Lorentzian manifold endowed with semi-symmetric metric connection and we get some important results for such submanifolds.

Keywords: Lorentzian manifold, Chen inequalities, Half-lightlike submanifold, Semi-symmetric Metric Connection.
2010 Mathematics Subject Classification: 53C15, 53C25, 53C40.

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On Geometry of Semi-Invariant Lightlike Submanifolds of Golden Semi Riemannian Manifolds

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Abstract

In this paper, we research geometry of semi-invariant lightlike submanifolds of golden semi-Riemannian manifolds and we obtain some results. Finally, we give an example for such submanifolds.

Keywords: Golden semi Riemannian manifold, semi-invariant submanifolds, lightlike submanifold, golden structure.
2010 Mathematics Subject Classification: 53C15, 53C25, 53C50.

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Some Inequalities on Slant Riemannian Submersions from Cosymplectic Space Forms

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Abstract

In this study, we obtain some inequalities on the vertical and horizontal distributions on slant Riemannian submersions from cosymplectic manifolds onto Riemannian manifolds. Using these inequalities, we obtain some characterizations for slant Riemannian submersions from cosymplectic space forms. Moreover, the equality cases are considered and we give some examples.

Keywords: Riemannian submersion, slant submersion, Chen inequality, cosymplectic manifold, vertical distribution.
2010 Mathematics Subject Classification: 53C15, 53B20.

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A Study on Golden GCR-Lightlike Submanifolds of Golden Semi-Riemannian Manifolds

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Abstract

In this study, we review golden GCR-lightlike submanifolds of golden semi-Riemannian manifolds and obtain some geometric results for such submanifolds. We get some conditions for minimal golden GCR-lightlike submanifolds of golden semi-Riemannian manifolds. Moreover, we provide an example for such submanifolds.

Keywords: Golden semi-Riemannian manifolds, Golden structure, Lightlike submanifolds, Golden GCR-lightlike submanifolds.
2010 Mathematics Subject Classification: 53C15, 53C40, 53C50.

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Spherical Indicatrix Curves of Anti-Salkowski Curve in 3-dimensional Minkowski Space

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Abstract

According to E. Salkowski, anti-Salkowski curves are defined as a family of curves with constant second curvature and non-constant first curvature. In literature, these curves are known as anti-Salkowski curves and the equation of anti-Salkowski curve is defined by J. Monterde. In this study, the spherical indicatrix curves of the given anti-Salkowski curve with a spacelike principal normal in Minkowski 3-space are obtained. The Frenet vectors and curvatures of that curves are calculated and later, it is found the darboux vectors of the spherical indicator curves of the anti-Salkowski curve. Some theorems and conclusions related with these kinds of curves are proved.

Keywords: Anti-Salkowski curves, spherical images, Minkowski space.
2010 Mathematics Subject Classification: 53A04.

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Focal Surfaces of Tubular Surfaces in Modified Orthogonal Frame

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Abstract

Canal surfaces, which are quite often used in computer-aided design(CAGD) for solid and surface modeling are defined as the envelope of a moving sphere of variable radius. M canal surface is envelope of a one-parameter set of spheres, centered at a center curve $c(s)$ with radius $r(s)$. If the radius function is constant then this surface called tubular surface. Focal surfaces are known as line congruences. In fact, line congruences are surfaces which are obtained from by transforming one surface to another by lines.Focal surface is one of these congruences.

In this study, focal surfaces of tubular surfaces were investigated in Euclidean 3-space according to the modified orthogonal frame. First, the basic definitions were given and modified orthogonal frame was introduced. After tubular surfaces were obtained with respect to modified orthogonal frame. Some important results were obtained such as that the focal surfaces of tubular surfaces were flat and there was no minimal surface. In addition, asymptotic and geodesic curves of the focal surfaces were investigated. Finally, an example was given for these surfaces according to the modified orthogonal frame in Euclidean 3-space.
Keywords:Tubular Surfaces,Focal Surfaces, Modified Orthogonal Frame,
2010 Mathematics Subject Classification: 53A05,53B25.

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Fractional Derivative Approaches on Differential Geometry of Curves

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Abstract

Fractional analysis was formed by world-famous mathematicians as a rational-order generalization of ordinary differential and integral concepts. In addition to gaining importance in the theoretical part of mathematics, it also took part in the solution of various problems in the field of application such as viscoelastic theory, fluid mechanics, dynamical systems.

The aim of this talk is to formulate the geometry of curves by choosing the Caputo fractional derivative operator, which is one of the fractional derivatives in the theory of curves, which is a sub-branch of differential geometry.

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Keywords: Caputo fractional derivative, curvature, Frenet vectors, space curve.
2010 Mathematics Subject Classification: First: 26A33 Second: 53A04; 53A55.

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A Note on Vietoris' Polynomials

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Abstract

In 1958, Vietoris used Appell polynomials in connection with positivity problems of trigonometric sums, [1]. Positivity as an interdisciplinary subject was an active research field at that time and several works were conducted using Vietoris' results [2, 3]. Later on, in [4], the authors studied Vietoris, number sequence $\{v_n\}_{n\geq 0}$ in with nth term formula $v_n = \frac{1}{2^n}\binom{n}{\lfloor \frac{n}{2} \rfloor}$, where $\binom{n}{\lfloor \frac{n}{2} \rfloor}$ is the central binomial coefficient and $\lfloor , \rfloor$ is representation of floor function, [5, 6, 7, 8]. This sequence is related with the sequence A283208 in OEIS, [9])

Number sequences and their properties, which have an important place in mathematics, have been studied by many researchers. The polynomial forms first started with the Fibonacci polynomials, [10, 11, 12]. In number theory, since Fibonacci-type polynomials have some considerable applications in geometry and algebra, several authors have studied on these polynomials. For any variable quantity x, the Fibonacci polynomial $F_n(x)$ is defined as $F_n(x) = xF_{n-1}(x) + F_{n-2}(x)$ for $n \geq 2$ with $F_0(x) = 0, F_1(x) = 1$, [13, 15, 14, 16, 17, 18, 19, 20, 21]. With similar idea, polynomials of Pell, Pell-Lucas[22], Jacobsthal [23], Van Der Laan [24], Oresme [25] and many others can be found in literature.

In this study, inspired by existing studies, we defined Vietoris, polynomials. Also, we obtain basic properties, recurrence relations, generating function, special equalities and identities of these type of polynomials.

Keywords: Vietoris, numbers, polynomials, recurrence relations.
2010 Mathematics Subject Classification: 11B83, 11B37, 05A10.

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Pseudo-Galilean Magnetic Flux Tubes and Split Semi-Quaternions

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Abstract

We introduce generalized magnetic flux tubes in pseudo-Galilean 3-space and obtain the local magnetic field components of these surfaces. We realize that the pseudo-Galilean scalar product (and the pseudo-Galilean vector product) of two vectors $\vec{u}$ and $\vec{v}$ coincides with the scalar product (and the vector product) in the multiplication formula of split semi-quaternions with vector parts $\vec{u}$ and $\vec{v}$ if at least one of the vectors is non-isotropic. With the help of this fact we show how to form these magnetic flux tubes by using split semi-quaternions or their matrix representations.

Keywords: Pseudo-Galilean space, split semi-quaternion, magnetic flux tube.
2020 Mathematics Subject Classification: 53A35, 51A05, 11R52, 53Z05, 53A17.

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On the Framed Rectifying Curves in Euclidean 4-space

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Abstract

Rectifying curves are introduced for regular curves in [1] as space curves whose position vector always lies in its rectifying plane. The aim of this paper is to introduce framed rectifying curves, which have singular points, in the Euclidean 4−space. By using the adapted frame in [2], we defined framed rectifying curves in the Euclidean 4−space. Then, We obtain some characterizations of framed rectifying curves in terms of their framed curvature functions.
Keywords: Rectifying curves, framed curves, singular points.
2010 Mathematics Subject Classification: 53A04, 58K05.

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Normal Curves According to the Case 2 Extended Darboux(ED)-Frame in Euclidean 4-Space

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Abstract

In this paper,we define normal curves according to the Case 2 Extended Darboux(ED)-frame in Euclidean 4-space. Then, according to Case 2 ED-frame fields, the necessary and sufficient condition for a unit speed curve lying on the hypersurface to be congruent to a normal curve is obtained. For these necessary and sufficient conditions, the solutions of the differential equations have been investigated. Finally, an application has been made on the subject.
Keywords: Normal curves, extended darboux frame, geodesic curvature, geodesic torsion.
2010 Mathematics Subject Classification: 53A04, 53A07.

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A Geometric View to Fixed Point Theory on A Metric Space: Fixed Ellipses

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Abstract

Classical fixed-point studies usually focus on determining the necessary and sufficient conditions for a self-mapping to have a unique fixed point. But the set of fixed points of a self-mapping may has more than one point. Thus, a meaningful question arises: "What are the geometric properties of the set of fixed points of such self mappings?(See for more detail [2, 1]).

In this work, we give some theorems which explain existence and uniqueness conditions for fixed ellipse of self-mappings on a metric space together geometric interpretation. So, we will provide a geometrical perspective to the classical metric fixed point theory. Also we support our theoretical results with some illustrative extraordinary examples (See for more detail [3]).

Keywords: Fixed Circle Theory, Fixed Ellipse Theory.

2010 Mathematics Subject Classification: 47H10, 37E10, 54H25, 55M20.

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On (k,μ)-Paracontact Manifolds

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Abstract

Aim of this paper is to study the curvature tensors of (k,μ)-Paracontact manifold satisfying the conditions $R\cdot P_*=0$, $R\cdot L=0$, $R\cdot W_1=0$, $R\cdot W_0=0$ and $R\cdot M=0$. According these cases, (k,μ)-Paracontact manifolds have been characterized such as η-Einstein and Einstein. We think that some interesting results on a (k,μ)-Paracontact metric manifold are obtained.

Keywords: (k, μ)-Paracontact Manifold, η-Einstein manifold, Riemannian curvature tensor.
2010 Mathematics Subject Classification: 53C15, 53C25.

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Pseudo-Slant Submanifolds of Lorentzian Kenmotsu Manifolds

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Abstract

In this paper, pseudo-slant submanifolds of Lorentzian Kenmotsu manifold are studied. Necessary and sufficient conditions are given on a submanifold of Lorentzian Kenmotsu manifold to be pseudo-slant submanifold. We study integrabilities and parallel conditions of the distribution on pseudo-slant submanifolds of Lorentzian Kenmotsu manifold. Morever, we also study pseudo-slant submanifolds of locally warped product Lorentzian Kenmotsu manifold. We are given examples of slant submanifold a warped product Lorentzian Kenmotsu manifold.

Keywords: Lorentzian Kenmotsu manifold, Lorentzian Kenmotsu space form, pseudo-slant submanifold.
2010 Mathematics Subject Classification: 53C17, 53C25, 53C40.

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Bicovariant Differential Calculus on the Superalgebra $\mathcal{O}(\mathrm{GL}_{h,h'}(1|1))$

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Abstract

Noncommutative geometry is the idea that the geometric structure is constructed by the generators of an algebra that need not be commutative as coordinate functions. When the algebra is associative, it can be tempting to also generalize the corresponding notions of differential geometry.

Quantum groups arise as deformations of Lie groups. Lie groups have two types of deformation: the first is q-deformation or standard deformation [3] and the other is h-deformation or non-standard deformation [1]. The quantum super groups [2] has considered as a natural generalization of the notion of Lie supergroups.

The noncommutative differential geometry of quantum groups was first introduced by Woronowicz in [4, 5]. The algebric construction of differential calculus in terms of Hopf structure allows to extend the ordinary differential geometric quantities to a variety of interesting spaces that included quantum groups.

The superalgebra $\mathcal{O}(\mathrm{GL}(1|1))$ is defined as polynomial superalgebra $\mathbb{C}[a,\beta,\gamma,d]$, where a,β,γ,d are elements of an associative unital superalgebra $\mathcal{A}$. Here one assumes that the formal inveres of a and d are exist. This superalgebra $\mathcal{O}(\mathrm{GL}(1|1))$ is a Hopf superalgebra and is called the coordinate algebra of the supergroup $\mathrm{GL}(1|1)$.

The two-parameter non-standard deformation [6] of the super group $\mathrm{GL}(1|1)$ is denoted by $\mathcal{O}(\mathrm{GL}_{h,h'}(1|1))$. In this work, we set up a noncommutative differential calculus on the superalgebra $\mathcal{O}(\mathrm{GL}_{h,h'}(1|1))$. This calculus involves the (h,h')-deformed commutation relations of between the generators of $\mathcal{O}(\mathrm{GL}_{h,h'}(1|1))$ and their differentials. We will find the required relations by using the bicovariace. It will be shown that exist an algebra homomorphism

$$\sigma : \mathcal{O}(\mathrm{GL}_{h,h'}(1|1)) \longrightarrow M_4(\mathcal{O}(\mathrm{GL}_{h,h'}(1|1)))$$

preserving the relations between the generators of the superalgebra $\mathcal{O}(\mathrm{GL}_{h,h'}(1|1))$. Using this map acting to the generators of the superalgebra, we will get their matrix representations that preserve the structure of the superalgebra $\mathcal{O}(\mathrm{GL}_{h,h'}(1|1))$.

Keywords: Standard deformation, non-standard deformation, quantum superalgebra, Hopf superalgebra, bicovariance of calculus.
2010 Mathematics Subject Classification: 17B37, 81R60.

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Legendre Curves of Finite Type in $\mathbb{R}^{(2+t)}(-3t)$ Space

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Abstract

Baikoussis and Blair [1,2] proved that a Legendre curve of constant curvature on $\mathbb{R}^3(-3)$ lies in cylinder $N^2(c)$ and is a 1-type, conversely, a 1-type Legendre curve is a curve with constant curvature. Camcı and Hacısalihoğlu [3,4] studied the finite type curves in $\mathbb{R}^3(-3)$ Sasaki space which lie on a cylinder $N^2(c)$ and proved that a 1-type curve lying on a cylinder $N^2(c)$ is of constant curvature but it is not true vice versa. Furthermore they proved that a curve in $\mathbb{R}^3(-3)$ which lies on a cylinder $N^2(c)$ is finite type if and only if the curve is of 1-type. In this study, we examine the conditions of a curve lying on a cylinder whose based curve is a circle in $xOy_$ plane to be of finite type. Also, we obtain the relations between the curvatures of a Legendre curve in the aforementioned cylinder in $\mathbb{R}^{2+t}(-3t)$ and to be of finite type of it.

Keywords: Legendre curves, finite type curve, 1-type curve.
2020 Mathematics Subject Classification: 53C15, 53C25.

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Some Notes on Deformed Lifts of 2-jets

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Abstract

Let now $T^2(M_r)$ be the bundle of 2-jets, i.e. the tangent bundle of order 2 over C^∞-manifold M_r, $dimT^2(M_r) = 3r$ and let $(x^i, x^{\bar{i}}, x^{\bar{\bar{i}}})$ be an induced local coordinates in $T^2(M_r)$. We proved that bundle $T^2(M_r)$ is a real modeling of $R(\varepsilon^2)$-holomorphic manifold $X_r(R(\varepsilon^2))$ and $T^2(M_r)$ has a natural integrable structure $\Pi = \left\{I, \gamma, \gamma^2\right\}, I = id_{T^2(M_r)}$. Using this fact in the bundle of 2-jets we introduce the ${}^C\omega$ deformed complete lifts of ω and ${}^I\omega$ *deformed intermediate lift* of ω, where $\omega = \omega_i dx^i$ is be a 1-form in M_r. Then exterior differentials of deformed intermediate, complete lifts of ω and deformed complete, intermediate and vertical lifts of differentials dx^i were investigated in $T^2(M_r)$.

Keywords: Holomorphic functions, bundle of 2-jets, deformed lift, 1-forms.
2010 Mathematics Subject Classification: 53C07, 53C15.

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A Note on W_3 Curvature Tensor in α-cosymplectic Manifolds

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Abstract

The object of the present paper is to study the geometrical properties of W_3 curvature tensor in α-cosymplectic manifolds. We have shown that a W_3-flat α-cosymplectic manifold is an Einstein manifold, W_3-symmetric and W_3-flat α-cosymplectic manifold is a flat space, and W_3-semi symmetric α-cosymplectic manifold is a W_3-symmetric manifold.

Keywords: α-cosymplectic manifold, W_3 -curvature tensor
2010 Mathematics Subject Classification: 53C25, 53D15.

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Surfaces with Constant Negative Gaussian Curvature in The Simply Isotropic 3-Space

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Abstract

In this paper, we have consider Surfaces with Constant Negative Gaussian Curvature in the simply isotropic 3-Space by defined Sauer and Strubeckerr ([8,11]) . Firstly, we have studied the isotropic II-flat, isotropic minimal and isotropic II-minimal, the constant second gaussian curvature, the constant mean curvature of surfaces with constant negative curvature (SCNC) in the simply isotropic 3-space. Further, we have investigated isotropic the constant casorati, the tangential and the amalgamatic curvatures of SCNC.

Keywords: Constant negative gaussian curvature, Simply isotropic 3-space.
2010 Mathematics Subject Classification: Primary 53A35; Secondary 53B30.

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Adjoint Curve with Modified Orthogonal Frame

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Abstract

In this work, we give a new idea to create adjoint curve of a space curve by using modified orthogonal frame in both Euclidean and Minkowski 3-space. We obtain the modified othogonal frame vector fields, curvature and torsion of the adjoint curve and main curve. We characterize the conditions when these curves become general helix and Mannheim curve. Finally, we exemplify the curves with figures.

Keywords: Adjoint curve, general helix, modified orthogonal frame.
2010 Mathematics Subject Classification: 53A04, 53B30, 14H50.

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Lorentzian Para-Sasakian Manifolds with respect to the Schouten-van Kampen Connection

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Abstract

In the present paper we study Lorentzian para-Sasakian manifolds with respect to the Schouten-van Kampen connection. The paper is organized as follows: After Introduction, in section 2, firstly we give Lorentzian para-Sasakian manifolds and the Schouten-van Kampen connection. Then we adapt the Schouten-van Kampen connection on Lorentzian para-Sasakian manifolds. In section 3, we study conformally flat, projectively flat and conharmonically flat Lorentzian para-Sasakian manifolds with respect to the Schouten-van Kampen connection. Also we investigate Lorentzian para-Sasakian manifolds satisfying the conditions $\breve{R} \cdot \breve{Q} = 0$ and $\breve{Q} \cdot \breve{R} = 0$ with respect to the Schouten-van Kampen connection, respectively. In the last section, we give an example of a 3-dimensional Lorentzian para-Sasakian manifold with respect to the Schouten-van Kampen connection which is verify our corollaries.

Keywords: Lorentzian para-Sasakian manifolds, η-Einstein manifold, Schouten-van Kampen connection.
2010 Mathematics Subject Classification: 53B20, 53B25, 53B50.

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Parallel-like Surfaces of the Ruled Surfaces

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Abstract

In this study, it has been researched parallel-like surfaces of the ruled surfaces. The parametric expression of the parallel-like surface of a ruled surface was obtained and the changes between these surfaces were examined by considering their curvatures.

Keywords: Parallel-like Surfaces, Ruled Surfaces.
2010 Mathematics Subject Classification: 53A04, 53A05.

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Application of the Principle of Least Action to the Some Special Curve Types Under the Inverse Homothetic Motion

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Abstract

Some cycloid-type curves are expressed under closed planar inverse homothetic motion and the principle of least action is applied to these curves. The principle of least action is applied to these curves and the kinetic energies of the points of the moving plane are calculated in order to calculate the minimum action point of these curves under inverse homothetic motion.

Keywords: Inverse Homothetic Motion, Cycloid Type Curves, Principle of Least Action.
2020 Mathematics Subject Classification: 53A17, 53A99.

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Gradient Solitons on Warped-twisted Product Manifolds

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Abstract

In this study, we introduce new characterizations for warped-twisted product manifolds. We investigate gradient Riemann, gradient Ricci, gradient Yamabe solitons on warped-twisted product manifolds and we examine the effect of a gradient soliton on such manifolds to their factor manifolds and we also study the warped-twisted product quasi-Einstein manifolds.

Keywords: Warped product, twisted product, Riemann soliton, Ricci soliton, Yamabe soliton, quasi-Einstein manifold.
2010 Mathematics Subject Classification: 53C25, 53C20.

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A Short Note on ρ-Einstein Solitons

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Abstract

In this study, first we investigate the existence of ρ-Einstein solitons equipped on a warped product structure. Then we give two important applications for these solitons in Lorentzian and neutral settings, by using generalized Robertson-Walker metric and Walker metric respectively.

Keywords: ρ-Einstein soliton, warped product, generalized Robertson-Walker spacetimes, Walker metric.
2010 Mathematics Subject Classification: 53C25, 53C40.

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On f-biminimal Legendre Curves in (α, β)-trans-Sasakian Generalized Sasakian Space Form

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Abstract

In this study, f-biminimal Legendre curves in (α, β)-trans-Sasakian generalized Sasakian space forms are introduced. Necessary and sufficient conditions for a Legendre curve to be f-biminimal are obtained. Besides, some special cases are studied and some nonexistence theorems have been obtained.
Keywords: f-biminimal curves, generalized Sasakian space forms, Legendre curves.
2010 Mathematics Subject Classification: 53C25, 53C43.

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Cubic Polynomial Curve as the Bezier Curve in E^2

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Abstract

Polynomial curve as the arc segments on themselves can be written as an nth order Bezier curves with the $n+1$ control points. First, we have examined the control points based on the coefficient of the any cubic polynomial function. Second we extend our examinations to the coefficients of the cubic polynomial function based on the control points of the corresponding cubic Bezier curve. Further we give a three special cubic polynomial functions as cubic Bezier curves. Finally, we examine the analytical properties based on the control points of their cubic Bezier curves in E^2.

Keywords: cubic Bezier curves, , keyword three.
2010 Mathematics Subject Classification: First, Second.

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19th International Geometry Symposium
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A Geometric View to Fixed Point Theory on A Metric Space: Fixed Hyperbolas

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Abstract

Classical fixed-point studies usually focus on determining the necessary and sufficient conditions for a self-mapping to have a unique fixed point. But the set of fixed points of a self-mapping may has more than one point. Thus, a meaningful question arises: "What are the geometric properties of the set of fixed points of such self mappings?(See for more detail [2, 1]).

In this work, we give some theorems which explain existence and uniqueness conditions for fixed hperbolas of self-mappings on a metric space together geometric interpretation. So, we will provide a geometrical perspective to the classical metric fixed point theory. Also we support our theoretical results with some illustrative extraordinary examples (See for more detail [3]).

Keywords: Fixed Circle Theory, Fixed Hperbola Theory.

2010 Mathematics Subject Classification: 47H10, 37E10, 54H25, 55M20.

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On a Classification of Generalized Sasakian Space Forms

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Abstract

In this article, pseudo symmetry and Ricci pseudo symmetry of generalized Sasakian space forms are investigated on some special curvature tensors. Characterizations of generalized Sasakian space forms are obtained on some specially selected $\sigma-$curvature tensors. More importantly, the cases of $\sigma-$ pseudo symmetric and $\sigma-$ Ricci pseudo symmetric generalized Sasakian space forms are discussed and the behavior of the manifold is examined for each case. Again, necessary and sufficient conditions have been obtained for $\sigma-$ pseudo and Ricci pseudo symmetric generalized Sasakian space forms to be Einstein manifolds.
Keywords: Pseudo Symmetric Manifold, Ricci Pseudo Symmetric Manifold, Sasakian Space Forms.
2010 Mathematics Subject Classification: 53C15, 53C44.

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Intrinsic Geometry of a Linear First-Order ODE

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Abstract

We show that a linear first-order ordinary differential equation (ODE) of the form $\mathrm{d}y/\mathrm{d}x = y + Q(x)$ defines a totally geodesic pseudospherical surface, i.e. a totally geodesic surface with constant negative intrinsic curvature in the three-dimensional Riemannian manifold corresponding to $\mathrm{d}^2y/\mathrm{d}x^2 = y + Q' + Q$.

Keywords: Ordinary differential equations, Riemannian connection, pseudospherical surface, totally geodesic surface
2010 Mathematics Subject Classification: 53B20, 34A26.

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Graph Surfaces with Constant Gaussian Curvature and Constant Extrinsic Curvature in $\mathbb{H}^2 \times \mathbb{R}$

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Abstract

In this work we study graph surfaces with constant Gaussian curvature and constant extrinsic curvature in the product space $\mathbb{H}^2 \times \mathbb{R}$ which are invariant by parabolic screw motions. In particular, we determine flat and extrinsically flat graph surfaces in $\mathbb{H}^2 \times \mathbb{R}$.

Keywords: Parabolic screw motion, flat surface, extrinsically flat surface, constant Gaussian curvature.
2010 Mathematics Subject Classification: 53C42

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Isometries Between Timelike Helicoidal Surfaces and Rotational Surfaces in $\mathbb{E}_1^4$

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Abstract

An isometry between a helicoidal surface and a rotational surface in Euclidean 3-space was given by Bour in 1862 as follows.
Bour's Theorem: A helicoidal surface is isometric to a rotational surface so that the helices on the helicoidal surface correspond to the parallel circles on the rotation surface (see [3]). Ikawa [5] studied on Bour's theorem in Minkowski 3-space and he gave the parametrizations of isometric surface pairs which have same Gauss map. In Euclidean 4-space, Bour's theorem was studied by Hieu and Thang and they showed that isometric surfaces having same Gauss map are hyperplanar and minimal, [4]. Babaarslan and Sönmez [1] gave the parametrizations of three types of helicoidal surfaces which are generated by the rotations with 2-dimensional axes in Minkowski 4-space. Then, Babaarslan et al. [2] studied on Bour's theorem for such spacelike surfaces. In this talk, we continue to study on Bour's theorem for timelike helicoidal surfaces. Also, we investigate the geometric properties of isometric surfaces in Minkowski 4-space.

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Keywords: Rotational Surface, helicoidal surface, isometry, mean curvature, Gaussian curvature.
2010 Mathematics Subject Classification: 53A10, 53B30.

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Pointwise Semi-Slant Riemannian Maps (PSSRM) from almost Hermitian Manifolds

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Abstract

In this study, we define and study a new class of Riemannian maps which is called *pointwise semi-slant Riemannian maps (PSSRM)* from an almost Hermitian manifold onto a Riemannian manifold as a generalization of slant submanifolds, slant submersions, slant Riemannian maps, semi-slant submanifolds, pointwise semi-slant submersions, semi-slant Riemannian maps and pointwise slant Riemannian maps. We illustrate some examples. Then, for pointwise semi-slant Riemannian map between a complex space form and a Riemannian manifold, we give inequalities involving the Casorati curvature of the space $ker\varphi_*$.

Keywords: Riemannian map, semi-slant Riemannian map, Casorati curvature, pointwise semi-slant submersion, pointwise semi-slant Riemannian map.
2010 Mathematics Subject Classification: 53C15, 53B20.

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Properties of Leonardo Pauli Quaternions

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Abstract

In this paper, we examine the Leonardo Pauli quaternions with nonnegative and negative subscripts, and some properties related to them are obtained. Also, we get some relations, algebraic properties and equalities such as recurrence relation, Binet formula, generating function, exponential generating function, summation formulas, and matrix representations with respect to them.

Keywords: Leonardo numbers, Pauli quaternions, Leonardo Pauli quaternions.
2010 Mathematics Subject Classification: 11K31, 11R52.

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Rytov Curves related to the Framed Curve in 3d Space

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Abstract

In this study, we investigate the behavior of a linearly-polarized light wave in optical fiber and the rotation of the polarization plane along a framed curve in 3d space. We investigate the three cases of the geometric phase. The framed frame make allow to analyse the examine the geometric phase for singular points. Through the rotation of the polarization plane in the optical fiber the tip points of the polarization vector trace a curve called Rytov curve. Also, we showed that the rotation of the polarization vector can be describe by the Fermi-Walker parallel transportation rule. Furthermore, some examples are visualized through the MAPLE program.

Keywords: Applications to physics, Vector fields, Magnetic flows, Ordinary differential equations,Framed curve, Magnetic theory .
2010 Mathematics Subject Classification: 53Z04, 53B50, 37C10, 14H45, 14H50, 35A15, 70E17.

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Inversions with Respect to an Ellipse in a Non-Euclidean Geometry

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Abstract

Althougt inversion is ancient it is one of the most interesting transformations since it would be used to study on several theorems and problems in geometry as Ptolemy's theorem, Steiner porism, the problem of Apollonius, the Pappus chain, etc. Firstly Apollonious of Perga defined this transformation then Jakop Steiner investigated systematically in 1820s [1]. Classically it is defined with respect to a circle but Childress introduced inversions with respect to conics in real Euclidean plane in 1964 [2]. Some authors studied inversions with respect to an ellipse in real Euclidean plane in [3] and [4]. In [5] and [6] inversions with respect to taxicab circles and in [7] inversions with respect to circles in alpha plane are investigated.

In this work first we introduce the inversion in an ellipse in taxicab plane $\mathbb{R}^2_T$. Then we give general properties and basic concepts and we present some properties related with this inversion such as cross ratio and harmonic conjugates.

Keywords: Inversion, Eliptic Inversion, Taxicab Metric, Cross Ratio, Harmonic Conjugates
2010 Mathematics Subject Classification: 51F99, 51K05, 51K99, 51M15, 51M20, 51N20, 51P99.

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On Elliptic Biquaternionic Equations in Field Theory

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Abstract

In this study, we handle the factorization of the generalized wave equation through elliptic biquaternions with the help of the expression of energy in relativity. It is shown that generalized elliptic biquaternionic wave equations can be used to describe both quantum particles and the force fields responsible for their interaction. It is expressed that a field can be reformulated using the wave equation dependent on the Klein-Gordon differential operator and the advantages of the elliptic biquaternion algebra. In particular, we give the first-order and second-order wave equations for elliptic biquaternionic potentials describing fields with zero and non-zero quantum mass. The action of the operators on the elliptic biquaternionic wave equation is discussed. Then, we give the elliptic biquaternionic non-relativistic equation for quantum particles.
Keywords: Elliptic biquaternions, Dirac equation and Klein–Gordon equation, Maxwell equations.
2010 Mathematics Subject Classification: 11R52, 35Q41, 11R52.

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Abstracts of Poster Presentations

On The Time Evolution Equations of The Inextensible Curve in Minkowski 3-Space

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Abstract

In this work, we compute the time evolution equations of the curve in Minkowski 3-space. Also, we construct new surfaces via inextensible curves. Then, some geometric properties of these surfaces constructed by evolutions are obtained.
Keywords: Time evolution equation, inextensible curves.
2010 Mathematics Subject Classification: 53C44.

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A New Characterizations of Magnetic Pseudo Null Curves

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Abstract

This talk is based on investigating new geometric properties of a pseudo null magnetic curve in Minkowski 3-space. We give the pseudo null curve conditions for magnetic cases. Also we also obtained differential equations for a transformation between two pseudo-null curves, where the torsion of the magnetic curve must satisfy.

Keywords: Magnetic curve, null curves, killing magnetic.
2010 Mathematics Subject Classification: 53A35.

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