UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 9, September 2017

Common Fixed Points for Commuting and Weakly Compatible Self-maps on Digital Metric Spaces

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Abstract: In this paper, we introduce the notions of commutating, compatibility and weakly compatible mappings on digital metric spaces. Using this concept we prove some common fixed point theorems for a pair of self-maps on a digital metric space. We also give an example of a pair of self-maps which is weakly compatible but not compatible and give another example in support of our main result.

Keywords: Digital Image, digital Metric Space, Adjacency relation, Commuting mappings, Compatibility mappings, Weakly Compatible Mappings, Coincidence Point. **2010 MSC:** 47H10, 54E35, 68U10

1. INTRODUCTION

Fixed point theory plays an important role in functional analysis, and it has wider applications in differential and integral equations. Fixed point theory, broadly speaking, demonstrates the existence, uniqueness and construction of fixed points of a function or a family of functions.

The concept of a metric space was introduced by M. Ferchet [15] in 1906.

Fixed point theory has a good beginning from Banach contraction principle of Banach [1] (1922) with complete metric space as back ground. Many authors studied, extended, generalized and improved Banach fixed point theorem in many ways.

In 1976, G. Jungck [24] introduced commuting maps in a complete metric space. This result was generalized and extended for commuting mappings in various ways with several contractive types by many authors [7, 8, 9, 13, 22, 31, 36, 37].

Furthermore, B. E. Rhoades and S. Sessa [33] and S. Sessa [38] extended the result of K. M. Das and K. V. Naik [8] using the notion of generalized commuting mappings called weakly commuting mappings [14, 39, 40].

In 1986, G. Jungck [25] introduced more generalized concept of commutativity, called compatibility. This concept is more general than that of the weak commutativity due to S. Sessa [38]. In 1988, G. Jungck [23] proved some common fixed point theorems for weakly compatible mapping under several contractive conditions.

G. Jungck [27] defined a pair of self-mappings to be weakly compatible if they commute at their coincidence points. Various authors have introduced coincidence point results for various classes of mappings on metric spaces. For more details of coincidence points theory and related results see [26, 28, 32].

Many Authors, used this concept and proved common fixed point theorems on generalized metric spaces like Menger space, d - complete topological space, F – complete metric space, G – metric space, Fuzzy metric space, Cone Metric Spaces, etc.

Now we introduce this concept of digital metric spaces. Digital metric space is one of the generalizations of metric space and digital topology.

Digital topology is a developing area of general topology and functional analysis which studies feature of 2D and 3D digital image. Digital topology is the study of the topological properties of images arrays. A. Rosenfeld [34, 35] was the first to consider digital topology as a tool to study digital images. Kong [29], then introduced the digital fundamental group of a discrete object. The digital version of the topological concept was given by L. Boxer [2, 3, 4].

A. Rosenfeld [35] first studied the almost fixed point property of digital images. Ege and Karaca [11, 12] gave relative and reduced Lefschetz fixed point theorem for digital images. They also calculated the degree of antipodal map for the sphere like digital images using fixed point properties. Ege and Karaca [10] defined a digital metric space and proved the famous Banach Contraction Principle for digital images. But this paper has many slips and was refined and corrected by S. E. Han [21].

Based on these concepts K. Sridevi, M.V.R. Kameswari and D.M.K. Kiran [41] introduced $\varphi -$contractions and $\varphi -$contractive mappings on digital metric spaces. They proved an important Lemma and used it to prove the existence and uniqueness of fixed point theorems in digital metric spaces.

International Journal of Statistics and Applied Mathematics 2018; 3(2): 427-433

International Journal of Statistics and Applied Mathematics

ISSN: 2456-1452
Maths 2018; 3(2): 427-433

www.mathsjournal.com
Received: 12-01-2018
Accepted: 13-02-2018

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A common coupled fixed point theorem using E.A. like property in supernova spaces

K Sridevi, MVR Kameswari and DMK Kiran

Abstract
In this paper, we introduce a new space, named Supernova Space and provide an example. We prove a common coupled fixed point theorem for four maps satisfying the E. A. Like property and w-compatibility in this space. We also obtain some corollaries from this result.

Keywords: supernova space, center of supernova space, coupled fixed point, E. A. like property, W-compatible.

1. Introduction

A fixed point theorem was given by Brouwer [5] in 1912, after that the polish mathematician Stephan Banach [3] proved contraction mapping theorem and named Banach fixed point theorem in 1922. It is an important tool in the theory of metric spaces. Many authors studied, extended, generalized and improved this theory to generalized metric spaces like statistical metric spaces, Menger spaces, d-complete topological spaces, F-complete metric spaces, G-Metric spaces, Fuzzy Metric spaces, Quasi metric spaces, partial metric spaces, b-metric spaces, dislocated quasi b-metric spaces, complex valued metric spaces [6, 7, 8, 9, 11, 14, 16].

Bhaskar and Lakshmikantham [4] introduced the concept of coupled fixed points for a given partially ordered set$X$. After that Lakshmikantham and Ciric [10] defined coupled coincidence point and common coupled fixed point for a pair of maps and Samet *et al.* [12, 13] proved coupled fixed point theorems. K. P. R. Satstry *et al.* [15, 17, 18] proved some results on coupled fixed point theorems and G. V. R. Babu *et al.* [2] proved some results on coupled fixed point theorems in partially ordered metric spaces. Sumitra *et al.* [21] proved some results on coupled fixed point theorems in Fuzzy metric spaces.

K. Wadhwa *et al.* [21] introduced the notion of E. A. Like property in fuzzy metric spaces. Abbas *et al.* [1] introduced the notion of w-compatible mapping.

In this paper, we introduce a new space, named $supernova$ space and we extend the definition of E. A. Like property introduced by K. Wadhwa *et al.* [21] to $supernova$ space and prove a common coupled fixed point theorem for four maps satisfying w-compatibility in this new $supernova$ space. This paper accepted and presented in International Conference on Mathematical Sciences and Applications by D. M. K. Kiran [19].

2. Preliminaries:

Definition 2.1: Let X be non-empty set, $s \geq 1$ and $d: X \times X \longrightarrow R^+$ be a function. Consider the following conditions of d

(1.1.1) There exists a unique point x_0 such that$d(x,y) = d(y,x) = 0 \Longrightarrow x = y = x_0$.

(1.1.2)$d(x,y) \leq s[d(x,z) + d(z,y)]\ for\ all\ x,y,z \in X$.

Are satisfied. Then (X,d) is called $supernova$ space and s is called a parameter of(X,d), x_0 is called the centre of the $supernova$.

Example 2.2: Let $X = [0,1]$ and$d(x,y) = |x-y|^2 + |x|$. Then d is a $supernova$ space with $s = 2$.

International Journal of Mathematics And its Applications
Volume 5, Issue 4–E (2017), 775–791.
ISSN: 2347-1557
Available Online: http://ijmaa.in/

International Journal of Mathematics And its Applications

Common Fixed Point Theorems on Metric Space for Two and Four maps Using Generalized Altering Distance Functions in Five Variables and Applications to Integral Type Inequalities

Research Article

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Abstract: The concept of existence and uniqueness of fixed points by altering distance between points have been explored by many authors. In this paper, we obtain unique common fixed point results for two and four self mappings by altering distances sub compatible functions with generalization of contractive type condition and application to integral type inequalities.

MSC: 47H10, 54E35.

Keywords: Altering distance functions, Sub compatible, Generalized altering distance, Integral type inequalities.

1. Introduction

Fixed point theory plays an important role in functional analysis. This is a very extensive and wider field. The concept of a metric space was introduced by M. Ferchet [12]. Fixed point theory beginning from Banach contraction principle of Banach [2] (1922) with complete metric spaces as a background and went back to Brouwer fixed point theorem of Brouwer [7, 8] (1910) with $\mathbb{R}^n$ as background. It has wider applications in differential and integral equations in mathematical science and engineering. Many authors have extended, generalized and improved Banach's fixed point theorem in different ways. The study of the existence and uniqueness of common fixed point of mappings satisfying contractive type condition has been a very active field of research. Obtaining fixed point theorems for self-maps of a metric space by altering distances between the points with the use of certain continuous control functions is an interesting aspect. The fixed point theorems related to altering distances between points in complete metric spaces have been obtained initially by D. Delbosco [11] and F. Skof [23] in 1977. M. S. Khan et al. [15] initiated the idea of obtaining fixed point of self maps of a metric space by altering distance between the points with the use of a certain continuous control function. K. P. R. Sastry and G. V. R. Babu [21] discussed and established the existence of fixed points for the orbits of single self-maps and pairs of self-maps by using a control function. K. P. R. Sastry et al. [20, 22] proved fixed point theorems in complete metric spaces by using a

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A new approach to define a new integer sequences of Fibonacci type numbers with using of third order linear Recurrence relations

Cite as: AIP Conference Proceedings **2385**, 130005 (2022); https://doi.org/10.1063/5.0070691
Published Online: 06 January 2022

Thiruchinapalli Srinivas and Katterapalle Sridevi

Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Cryptographic coding to define Binary Operation on Set of Pythagorean triples

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ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Pythagorean theorem
Binary Operation
Cryptographic coding

ABSTRACT

The paper focuses to generate some subsets of Set of Pythagorean Triples P = $\left\{(\boldsymbol{x},\boldsymbol{y},\boldsymbol{z}) \in Z^3 : \boldsymbol{x}^2+\boldsymbol{y}^2=\boldsymbol{z}^2\right\}$. In particular, we are introduce to generate subsets of Set of Pythagorean Triples for each even and odd integers. And proposed cryptographic programming coding to generate following sub class of Set of Pythagorean Triples.Let S_1 = $\left\{\left(\boldsymbol{x},\left(\frac{\boldsymbol{x}}{2}\right)^2-1,\left(\frac{\boldsymbol{x}}{2}\right)^2+1\right) : \boldsymbol{x \text{ is an even number}}\right\}$ And S_2 = $\left\{\left(\boldsymbol{x},\frac{\boldsymbol{x}^2-1}{2},\frac{\boldsymbol{x}^2+1}{2}\right) : \boldsymbol{x \text{ is an odd number}}\right\}$.

Also proposed following cryptographic coding of Binary Operation '*' on P with (P, *) can form as at most commutative cyclic semi group . For some $P_1 = (x_1,y_1,z_1)$, P_2 =.(x_2,y_2,z_2)

$$P_1 * P_2 = \begin{cases} \left(\left(2(\boldsymbol{k}+\boldsymbol{m}+1),\ (\boldsymbol{k}+\boldsymbol{m}+1)^2-1,\ (\boldsymbol{k}+\boldsymbol{m}+1)^2+1\right)\right) \ \textit{If } \boldsymbol{x}_1 = 2k+1 \textit{ and } \boldsymbol{x}_2 = 2m+1, \textit{for some integers } k,m \\ \left(2(\boldsymbol{k}+\boldsymbol{m}),\ (\boldsymbol{k}+\boldsymbol{m})^2-1,\ (\boldsymbol{k}+\boldsymbol{m})^2+1\right) \ \textit{If } \boldsymbol{x}_1 = 2k \textit{ and } \boldsymbol{x}_2 = 2m, \textit{for some integers } k,m \\ (2(\boldsymbol{k}+\boldsymbol{m})+1,\ 2*(\boldsymbol{k}+\boldsymbol{m})*(\boldsymbol{k}+\boldsymbol{m}+1),\ 2*(\boldsymbol{k}+\boldsymbol{m})*(\boldsymbol{k}+\boldsymbol{m}+1)+1) \ \textit{other wise} \end{cases}$$

Also we are proven under this binary operation, Some of the elements (at most all the elements of S_1 and S_2) of P are generated by (1,0,1) $\in P$.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Nanoelectronics, Nanophotonics, Nanomaterials, Nanobioscience & Nanotechnology.

The solutions to the quadratic Diophantine equation $x^2+y^2=z^2$ are given by Pythagorean theorem. While several methods are exploded to generate Pythagorean triples with repetition. In this paper we are introduce to study to Generate disjoint Subsets of Set Of Pythagorean triples without repetition.

Let Set of Pythagorean Triples **P** = $\left\{(x,y,z) \in z^3 : x^2+y^2=z^2\right\}$

Corollary 1:. $\boldsymbol{G}$=$\left\{(4\boldsymbol{m},\ 4\boldsymbol{m}^2-1,\ 4\boldsymbol{m}^2+1) : \boldsymbol{for\ some\ integer\ m}\right\}$ is a subset of P.

Proof:. Consider Reciprocal Summation of two consecutive odd numbers, which is equals to $\frac{a}{b}$ and $c = b + 2$ can become as Pythagorean Triples (a, b, c), which is explained as follows

$\frac{1}{2m-1}+\frac{1}{2m+1}=\frac{4m}{4m^2-1}$implies the result $(4m, 4m^2-1, 4m^2+1)$ becomes to Pythagorean Primitive Triple for m = 1,2,3,4,……, because of above triple can Satisfies statement of Pythagorean Theorem

$(4m)^2+\left(4m^2-1\right)^2 = \left(4m^2+1\right)^2$. It proves that $\boldsymbol{G}$ = $\left\{(4\boldsymbol{m}, 4\boldsymbol{m}^2-1, 4\boldsymbol{m}^2+1) : \boldsymbol{for\ some\ integer\ m}\right\}$ is a subset of P.

Corollary 2:. K = $\{(2m+1, 2m(m+1), 2m(m+1)+1)) : \boldsymbol{for\ some\ integer\ m}\}$ is a subset of P.

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https://doi.org/10.1016/j.matpr.2021.06.102
2214-7853/© 2021 Elsevier Ltd. All rights reserved.
Selection and peer-review under responsibility of the scientific committee of the International Conference on Nanoelectronics, Nanophotonics, Nanomaterials, Nanobioscience & Nanotechnology.

Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Existence of inner addition and inner multiplication on Set of Triangular numbers and some inherent properties of Triangular numbers

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ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Triangular numbers
Binary operation
Semi ring
Integer Modulo

ABSTRACT

The set Ptof real parameters for a fuzzy number belonging to a general family of all important parameters are calculated such that a triangular fuzzy number with the same value of the parameter exists for every specified flozzy number. We suggest a method for computing a triangular fuzzy number closest to p/Pt, and review the identity features, scale and translation invariance, additivity and consistency of the approximation operator obtained. Examples of recent findings in this topic and implementation of a flush-number retaining the value for the near triangular approximation. In this paper, we are revisits the topic of TRIANGULAR NUMBERS with new perspective direction to generate them to all integers and proved some of their inherent properties. Also we are defined two types of binary operations inner addition and inner multiplication are satisfied by triangular numbers, which are represented in below.

According these binary operations, we are proven is almost Semi Ring under inner addition and inner multiplication. Also we are finding the relation between Triangular numbers with Pascal triangles. And we are proven some of their Inherent Properties.

1. Introduction

We know that it is applicable for Handshake Puzzle, Full Mesh Network, Number Strip Puzzles….etc. But it is defined $\boldsymbol{T_n} = \frac{\boldsymbol{n}(\boldsymbol{n}+1)}{2}$ only for positive integers. Now we can extended this definition to negative integers also (without changing of original result). Which is defined as follows.

$$\boldsymbol{T_n} = \begin{cases} \frac{\boldsymbol{n}(\boldsymbol{n}+1)}{2} ifnis + Ve \\ \frac{\boldsymbol{n}(\boldsymbol{n}-1)}{2} ifnis - Ve \end{cases}$$

1.1. Now we can go to discuss some of their inherent properties.

Property 1:
It is an even function$T_{-n} = T_n$
Proof:

for $nis + Ve$, $T_n = \frac{n(n+1)}{2}$, Now we can replace n by –n, it follows that $\frac{-n(-n+1)}{2}$ = T_{-n}, which is equals to $\frac{n(n-1)}{2}$. Hence we can states that It is an even function $T_{-n} = T_n$ (Table 1. Table 2. Fig. 1).

As stated in below table shows the result $T_{-n} = T_n$.

Property 2:

Now we can define inner additive ('$\oplus$') binary operation on $\boldsymbol{T_n}$, for some $\boldsymbol{n}_1$,$\boldsymbol{n}_2 \in \boldsymbol{z}$

$$\boldsymbol{T}_{\boldsymbol{n}_1 \oplus \boldsymbol{n}_2} = \begin{cases} \boldsymbol{T}_{\boldsymbol{n}_1} + \boldsymbol{T}_{\boldsymbol{n}_2} + \boldsymbol{n}_1\boldsymbol{n}_2 if \boldsymbol{n}_1, \boldsymbol{n}_2 botharesamesign \\ \boldsymbol{T}_{\boldsymbol{n}_1} + \boldsymbol{T}_{\boldsymbol{n}_2} + (\boldsymbol{n}_1 + 1)\boldsymbol{n}_2 if \boldsymbol{n}_1 is + Ve, \boldsymbol{n}_2 is - Veand \boldsymbol{n}_1 + \boldsymbol{n}_2 is + Ve \\ \boldsymbol{T}_{\boldsymbol{n}_1} + \boldsymbol{T}_{\boldsymbol{n}_2} + \boldsymbol{n}_1(\boldsymbol{n}_2 - 1) if \boldsymbol{n}_1 is + Ve, \boldsymbol{n}_2 is - Veand \boldsymbol{n}_1 + \boldsymbol{n}_2 is - Ve \\ \boldsymbol{T}_{\boldsymbol{n}_1} + \boldsymbol{T}_{\boldsymbol{n}_2} + \boldsymbol{n}_1(\boldsymbol{n}_2 + 1) if \boldsymbol{n}_2 is + Ve, \boldsymbol{n}_1 is - Veand \boldsymbol{n}_1 + \boldsymbol{n}_2 is + Ve \\ \boldsymbol{T}_{\boldsymbol{n}_1} + \boldsymbol{T}_{\boldsymbol{n}_2} + (\boldsymbol{n}_1 - 1)\boldsymbol{n}_2 if \boldsymbol{n}_2 is + Ve, \boldsymbol{n}_1 is - Veand \boldsymbol{n}_1 + \boldsymbol{n}_2 is - Ve \end{cases}$$

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https://doi.org/10.1016/j.matpr.2021.05.502
2214-7853/

Please cite this article as: S. K and S. Thiruchinapalli, Existence of inner addition and inner multiplication on Set of Triangular numbers and some inherent properties of Triangular numbers, Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.2021.05.502

Fixed Point Theorems for Digital Contractive Type Mappings in Digital Metric Spaces

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Abstract—*In this paper, we introduce a class Φ and define φ −contractive type mappings for digital metric spaces. We prove a crucial Lemma in digital metric spaces. Using this Lemma we prove existence and uniqueness of fixed point theorems in digital metric spaces. And we obtain Banach contraction principle in digital metric spaces as a corollary. We also give examples to illustrate our result.*

Keywords:

Digital image, Digital metric space, Banach contractive principle, $\varphi - contraction$, $\varphi - contractive$, Finite sequence, increasing and strictly decreasing sequence, $\alpha - admissible$.

2010 MSC: 47H10, 54E35, 68U10

I. INTRODUCTION

Fixed point theory plays an important role in functional analysis, and it has wider applications in differential and integral equations. Fixed point theory, broadly speaking, demonstrates the existence, uniquenessand construction of fixed points of a function or a family of functions under diverse assumptions about the structure of the domain **X** (such as a metric space or normed linear space or a topological space) of the concerned functions.

The concept of a metric space was introduced by **M. Ferchet** [18] in **1906**. Fixed point theory beginning from Banach contraction principle of **Banach** [1] **(1922)** with complete metric spaces as a background and went back to Brouwer fixed point theorem of **Brouwer** [7, 8] **(1910)** with $\mathbb{R}^n$ as background. It begins with some literature in **1960**'s goes up to **1990**'s which includes variants and generalizations of Banach contraction principle [9, 13, 20, 21, 35].

Extension and development of this fixed point theory other than metric spaces, which are generalizations of metric spaces, such as statistical metric spaces, Menger spaces, d – complete topological spaces, F – complete metric spaces, G – Metric spaces, Fuzzy Metric spaces was carried by several authors [10, 11, 12, 14, 19, 32, 33, 34].

Digital topology is the study of the topological properties of images arrays. The results provide a sound mathematical basis for image processing operations such as image thinning, border following, contour filling and object counting.

Digital topology is a developing area on general topology and functional analysis which studies feature of 2D and 3D digital image. **Rosenfeld** [24, 25], first to consider digital topology as a tool to study digital images. **Kong** [22], then introduced the digital fundamental group of a discrete object. The digital version of the topological concept was given by **Boxer** [2, 3, 4].

A. Rosenfeld [25] first studied the almost fixed point property of digital images. **Ege and Karaca** [16, 17] gave relative and reduced Lefschetz fixed point theorem for digital images. They also calculated the degree of antipodal map for the sphere like digital images using fixed point properties. **Ege and Karaca** [15] defined a digital metric space and proved the famous Banach Contraction Principle for digital images. But this paper has many slips and was refined and corrected by **S. E. Han** [31].

In this paper, we introduce $\varphi -$ contractions and $\varphi -$ contractive mappings on digital metric spaces. We prove an important Lemma and use it to prove the existence and uniqueness of fixed points in digital metrics spaces.

II. PRELIMINARIES

Let X be a subset of $\mathbb{Z}^n$ for a positive integer n where $\mathbb{Z}^n$ is the set of lattice points in the n – dimensional Euclidean Space and ℓ represent an adjacency relation for the members of X. A digital image consists of (X, ℓ).

2.1 Definition (Boxer [3]): Let ℓ, n be positive integers, $1 \le \ell \le n$ and p, q be two distinct points

$$p = (p_1, p_2, \dots, p_n),\ \ q = (q_1, q_2, \dots, q_n) \in \mathbb{Z}^n \quad --- (2.1.1)$$

p and q are $\ell -$ adjacent if there are at most ℓ indices i such that $|p_i - q_i| = 1$ and for all other indices j such that $|p_j - q_j| \neq 1,\ p_j = q_j$.

The following statements can be obtained from definition 2.1

Available online at http://scik.org
J. Math. Comput. Sci. 2022, 12:174
https://doi.org/10.28919/jmcs/7488
ISSN: 1927-5307

ON A SUBCLASS OF ANALYTIC FUNCTIONS INVOLVING HURWITZ-LERCH ZETA FUNCTION

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Abstract. In this work, we introduce and investigate a new class of analytic functions in the open unit disc U with negative coefficients. The object of the present paper is to determine coefficient estimates, neighborhoods and partial sums for functions f belonging to this class.

Keywords: analytic; starlike; coefficient estimate; partial sums.

2010 AMS Subject Classification: 30C45.

1. INTRODUCTION

Let A denote the class of analytic functions f defined on the unit disk $U = \{z : |z| < 1\}$ with normalization $f(0) = 0$ and $f'(0) = 1$. Such a function has the Taylor series expansion about the origin in the form

$$f(z) = z + \sum_{n=2}^{\infty} a_n z^n, \tag{1}$$

denoted by S, the subclass of A consisting of functions that are univalent in U.

For $f \in A$ given by (1) and $g(z)$ given by

$$g(z) = z + \sum_{n=2}^{\infty} b_n z^n \tag{2}$$

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Received May 10, 2022

JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 7, ISSUE 19, 2020

A NEW APPROACH TO DEFINE TWO TYPES OF BINARY OPERATIONS ON SET OF PYTHAGOREAN TRIPLES TO FORM AS AT MOST COMMUTATIVE CYCLIC SEMI GROUP.

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Received: 14 April 2020 Revised and Accepted: 8 August 2020

ABSTRACT: Let P be a collection of all Pythagorean triples , defined as P = $\{(a,b,c) \in z^3 : a^2+b^2=c^2\}$. For some P$_1$ = $\{x_1, y_1, z_1\}$, P$_2$ = $\{x_2, y_2, z_2\}$ belongs to P.

Now we can define one of the Binary Operation '*' on P .

$$\mathbf{P_1 * P_2} = \begin{cases} \left(x_1+x_2, \left(\frac{x_1+x_2}{2}\right)^2-1, \left(\frac{x_1+x_2}{2}\right)^2+1\right) \text{ if } x_1+x_2 \text{ is even} \\ \left(x_1+x_2, \frac{(x_1+x_2)^2-1}{2}, \frac{(x_1+x_2)^2+1}{2}\right) \text{ if } x_1+x_2 \text{ is odd} \end{cases}$$

And another Binary Operation 'o' is defined as follows.

P$_1$ o P$_2$ =

$$\begin{cases} (x,y,z): \frac{z}{y} = 1 + \frac{2}{x^2-1} \text{ if } x = x_1+x_2 \text{ is odd prime number and its powers} \\ (x,y,z): \frac{z}{y} = 1 + \frac{2}{\left(\frac{x}{(2p-1)^2}\right)^2-1} \text{ if } x = x_1+x_2 \text{ is odd composite and its powers, for some } p = 1,2,3.. \\ (x,y,z): \frac{z}{y} = 1 + \frac{2}{\left(\frac{x}{2}\right)^2-1} \text{ if } x = x_1+x_2 \text{ is only power of 2 i.e geometric series of } \{2^x\} \\ (x,y,z): \frac{z}{y} = 1 + \frac{2}{\left(\frac{x}{2p^2}\right)^2-1} \text{ if } x = x_1+x_2 \text{ is even composite but not only power of 2, for some } p = 1,2,3 \ldots. \end{cases}$$

We are proved that these two binary operations are well defined and satisfies Associative and commutative properties on Set of Pythagorean triples. Also we prove that (1,0,1) is generates at most Pythagorean triples ,under above binary operations . So we can states that (P,*) , (P, o) are becomes to at most Commutative Cyclic Semi Group.

KEYWORDS: Pythagorean triple , binary operation, Cyclic semi group, Generator.

I. MAIN RESULT:

CASE 1: First we can go to prove that the binary operation '*' is well defined and under this binary operation (P,*) is becomes to Semi Group.
Now we can define two different Sets S$_1$ and S$_2$ by choosing of two positive integers x$_1$ and x$_2$.

Let $\mathbf{S_1} = \left\{x_1+x_2, \left(\frac{x_1+x_2}{2}\right)^2-1, \left(\frac{x_1+x_2}{2}\right)^2+1 : x_1+x_2 \text{ is even}\right\}$

Volume 65, Issue 9, 2021

Journal of Scientific Research

of

The Banaras Hindu University

A New Approach to Define Algebraic Structure and Some Homomorphism Functions on Set of Pythagorean Triples and Set of Reciprocal Pythagorean Triples

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Abstract: In this paper, focused to study Algebraic Structure and some Homomorphism functions On Set of Pythagorean Triples$\boldsymbol{P_T} = \{(\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z})\epsilon \boldsymbol{Z^3}: \boldsymbol{x^2} + \boldsymbol{y^2} = \boldsymbol{z^2}\}$and Set of Reciprocal Pythagorean triples $\boldsymbol{RP_T} = \{(\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z})\epsilon \boldsymbol{Z^3}: \frac{1}{x^2} + \frac{1}{y^2} = \frac{1}{z^2}\}$under the binary operation of usual multiplications. For some

$\boldsymbol{P_1} = (x_1, y_1, z_1)\epsilon \boldsymbol{P_T}, \boldsymbol{P_2} = (x_2, y_2, z_2)\epsilon \boldsymbol{P_T}$with $\quad \boldsymbol{p_1}.\boldsymbol{p_2} = \begin{Bmatrix} (|y_1y_2 - x_1x_2|, x_1y_2 + x_2y_1, z_1z_2) & [\boldsymbol{Lemma\ A}] \\ (x_1x_2, y_1z_2 + y_2z_1, y_1y_2 + z_1z_2) & [\boldsymbol{Lemma\ B}] \end{Bmatrix}$.

Also we are proven Every Pythagorean Triple (x, y, z) is having corresponding Reciprocal Pythagorean Triple in the form of (xz, yz, xy) $and\ vice\ versa$. Apply this corollary to define Algebraic Structure on Set of Reciprocal Pythagorean Triples. Also applied above binary operations of usual multiplication on Set of Sequence of Fibonacci type numbers to generate some subsets of Set of Pythagorean triples. Also focused to study some Homomorphism functions on Set of Pythagorean triples and Set of Reciprocal Pythagorean Triples. Also, we are proven some Properties of Trigonometric Ratio's and Compound Angles for Reciprocal Pythagorean Triples.

Index Terms: **Algebraic Structure, Binary Operation, Homomorphism functions, Pythagorean theorem, Reciprocal Pythagorean theorem.**

I. INTRODUCTION

The solutions to the quadratic Diophantine equation $a^2 + b^2 = c^2$ are given by Pythagorean theorem and corresponding Reciprocal Pythagorean Triples (a , b , h) is $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{h^2}$ with c = $\frac{ab}{h}$,here 'h' is a altitude, which are can be used in the computation of the area of a triangle.

P_1	P_2	$(\lvert y_1y_2 - x_1x_2\rvert, x_1y_2 + x_2y_1, z_1z_2)$
(5,12,13)	(4,3,5)	(16,63,65)
(7,24,25)	(3,4,5)	(75,100,125)
(4,3,5)	(8,15,17)	(13,84,85)
(4,3,5)	(4,3,5)	(8,24,25)
(3,4,5)	(8,15,17)	(36,77,85)
(1,0,1)	(8,15,17)	(8,15,17)
(1,0,1)	(1,0,1)	(1,0,1)

Advances and Applications in Mathematical Sciences
Volume 21, Issue 3, January 2022, Pages 1315-1327

ALGEBRAIC STRUCTURE OF RECIPROCAL PYTHAGOREAN TRIPLES

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Abstract

This paper focused to study the Algebraic Structure of Set of Pythagorean triples $P = \{(x, y, z) \in Z^3 : x^2 + y^2 = z^2\}$ by introducing to define various types of Binary Operations on Set of Pythagorean triples $P_1 \cdot P_2 = (| y_1y_2 - x_1x_2 |, x_1y_2 + x_2y_1, z_1z_2)$ and $P_1 \cdot P_2 = (x_1x_2, y_1z_2 + y_2z_1, y_1y_2 + z_1z_2)$. Also, we know that every Pythagorean triple (x, y, z) is having Corresponding Reciprocal Pythagorean triple (xz, yz, xy). Apply this corollary, to define Binary Operations and introduce to study Algebraic Structure of Set of Reciprocal Pythagorean Triples $RP = \left\{(x, y, z) \in z^3 : \frac{1}{x^2} + \frac{1}{y^2} = \frac{1}{z^2}\right\}$.

1. Introduction

The solutions to the quadratic Diophantine equation $x^2 + y^2 = z^2$ are given by the Pythagorean Theorem. From Reference [1], It is clear that A, B, C, D are Non empty subsets of Set of Pythagorean Triples $P = \{(x, y, z) \in Z^3 : x^2 + y^2 = z^2\}$, Where

2020 Mathematics Subject Classification: Primary 11D45, Secondary 11G45, 11G50.
Keywords: Pythagorean theorem, reciprocal Pythagorean theorem, algebraic structure, binary operation.
*Corresponding author; E-mail: sri.du.1980@gmail.com
Received October 10, 2021; Accepted November 15, 2021

Journal of Physics: Conference Series

PAPER • OPEN ACCESS

A New Approach to Define Length of Pythagorean Triples and Geometric Series Representation of Set of Pythagorean Triples

To cite this article: Thiruchinapalli Srinivas and K Sridevi 2022 *J. Phys.: Conf. Ser.* **2267** 012059

Pacific International Journal
ISSN 2616-4825 [Online] 2663-8991 [Print]
Vol. 03 No.03
http://pacificinternationaljournal.com/

Proof Of Fermat's Last Theorem By Choosing Two Unknowns in the Integer Solution Are Prime Exponents

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ARTICLE INFO
Article history:
Submission date: 05 May 2020;
1st Revision 13 July 2020;
2nd Revision: 05 Aug 2020;
Accepted: 28 Aug 2020;
Pages: 127-132

ABSTRACT
In this paper we are revisits well known problem in number theory ' proof of Fermat's last theorem ' with different perspective .Also we are presented for n>2, Diophantine equations K$(x^n + y^n) = z^n$ and $x^n + y^n = L\,z^n$ are satisfied by some positive prime exponents of x, y, z with some sufficient values of K and L. But it is not possible to find positive integers x, y and z, which are satisfies above equations with exactly K=1 and L=1. Clearly it proves the Fermat's last theorem, which states that No positive integers of x, y, z are satisfies the equation $x^n + y^n = z^n$ for n > 2.
KEYWORDS: Fermat's Last theorem, Diophantine equation, Prime Exponents.

INTRODUCTION:

We know that every integer is either prime or product of primes. Also we can verify easily above equations K$(x^n + y^n) = z^n$ and $x^n + y^n = L\,z^n$ are satisfied by some positive integers x, y, z
(which are primes or product of primes with exponent power is 1) with some sufficient values of K and L are not equal to 1 for n > 2. i.e we can verify Fermat's last theorem by choosing of x, y, z (exponent power is 1) to solve for K and L. Some examples are represented in below table.

TABLE 1:

Choose n value	Choose x value	Choose y value	Choose z value	K $=\frac{z^n}{x^n+y^n}$	L $=\frac{x^n+y^n}{z^n}$
3	2	3	5	3.57	0.28
3	3	4	5	1.37	0.728
3	2	5	7	2.57	0.3877
3	3	5	7	2.2565	0.4431
4	3	5	11	8.7565	0.1141
4	3	6	7	1.411522	0.7084
4	5	4	6	1.1428	0.875

Now we can solve for the values of K and L by choosing x and y are prime exponents whose power is more than one for proving Fermat's Last theorem.

WORKING RULE:

Consider the Diophantine equations K$(x^n + y^n) = z^n$ and $x^n + y^n = L\,z^n$. we are worked for finding 'z', 'K', 'L' values by choosing of x and y are prime exponents of 2,3 and 5.

Case 1: x, y is represented by Exponent of 2

Theorem 1: Let x= $2^p, y = 2^q, z = 2^p\left(1 + 2^{n(q-p)}\right), K = \left(1 + 2^{n(q-p)}\right)^{n-1}$ are satisfies the equation K$(x^n + y^n)$= z^n for all integer values of $p \geq 1$,$q \geq 1, p < q$, n≥1.

Proof: Let x= $2^p, y = 2^q$

Consider $x^n + y^n = (2^p)^n + (2^q)^n$

$$x^n + y^n = 2^{np} + 2^{nq}$$

$$x^n + y^n = 2^{np}\left(1 + 2^{n(q-p)}\right)$$

Now we can multiply both side with $\left(1 + 2^{n(q-p)}\right)^{n-1}$,we obtain that

$$\left(1 + 2^{n(q-p)}\right)^{n-1}(x^n + y^n) = 2^{np}\left(1 + 2^{n(q-p)}\right)^n$$

$$\left(1 + 2^{n(q-p)}\right)^{n-1}(x^n + y^n) = \left(2^p\left(1 + 2^{n(q-p)}\right)\right)^n$$

Journal of the Maharaja Sayajirao University of Baroda
ISSN : 0025-0422

SOME ALGEBRAIC PROPERTIES OF PARTIAL MULTIPLICATIVE ARITHMETIC FUNCTIONS WITH RESPECT TO PARTIAL BASIC SEQUENCE ON THE SET OF SQUARE-FREE INTEGERS

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ABSTRACT
In this paper, we consider arithmetic functions from a set of positive integers which are Square-free to Real numbers and also introduce Partial basic sequence. We establish some basic algebraic result of Partial Multiplicative Function with respect to partial basic sequences.

Key Words : Arithmetic functions, Square-free integers, Convolution, Partial basic sequence, Partial multiplicative functions.

1.INTRODUCTION

A real or complex valued function defined of the set of all natural numbers or the set of all positive integers is called an arithmetical function. Their various properties were investigated by several authors and they represent an important research topic [1, 2, 3, 4]. Properties of $\mathscr{B}$-multiplicative and quasi $\mathscr{B}$-multiplicative functions are studied in [5, 6].

In this paper, first we consider the set of square-free integers and define partial multiplication with respect to partial operator $*$ on $\mathring{A} \times \mathring{A}$. We introduce a partial basic sequence of $\mathring{A} \times \mathring{A}$satisfying three properties. We introduce convolution operator $\circ$ on partial basic sequence. Finally we prove some general properties of partial multiplicative arithmetic functions and define related the convolution. Using this convolution we establish some algebraic results on partial multiplicative functions.

2.PRELIMINARIES

Let$\mathbb{Z}^+$ Be the set of all positive integers.
Define $\mathring{A} = \{n \in \mathbb{Z}^+ \middle| n \text{ is squarefree}\}(\text{i.e.}, p \text{ is a prime}, p|n \implies p^2 \dagger n)$. Clearly $1 \in \mathring{A}$.
Let $*$ be the partial binary operator defined on $\mathring{A}$ as follows.
For $m, n \in \mathring{A},\ m * n = mn$is not always defined but it is defined only when $(m, n) = 1$.
$(\text{i.e.}, \text{gcd of } m, n = 1)$.
Let F be the sub set of $\mathring{A} \times \mathring{A}$ such that $(m, n) \in F$ if$(m, n) = 1$.
Thus $F = \{(m, n)|m, n \in \mathring{A}, (m, n) = 1\}$.
We observe that $m * n$ is defined if $(m, n) \in F$.
F has the following properties:

(i) $(a, b) \in F \Leftrightarrow (b, a) \in F$
(ii) Suppose $a, b, c \in \mathring{A}$. Then $(a, bc) \in F \Leftrightarrow (a, b) \in F, (a, c) \in F$ and$(b, c) = 1$
(iii) $(1, a) \in F$for all $a \in \mathring{A}$.

F is called partial basic sequence on $\mathring{A}$.
Note: Observe that

1. $m * n = n * m$ if $m, n \in \mathring{A}$ and$(m, n) = 1$.
2. $(l * m) * n = l * (m * n)$if $l, m, n \in \mathring{A}$ whenever one side is meaningful.
Here $(l, m) = 1$ and $(lm, n) = 1 \iff (m, n) = 1$ and$(l, mn) = 1$.

We define the convolution operator $\circ$ for functions defined on $\mathring{A}$.
Suppose $f : \mathring{A} \longrightarrow \mathbb{R},\ g : \mathring{A} \longrightarrow \mathbb{R}\ and\ h : \mathring{A} \longrightarrow \mathbb{R}$.
Define $f \circ g : \mathring{A} \longrightarrow \mathbb{R}$ by

ALGEBRAIC PROPERTIES OF CONVOLUTION OF ARITHMETIC FUNCTIONS ON THE PARTIAL SUB-BASIC SEQUENCE OF SQUARE-FREE ODD INTEGERS

Dr. K. Sridevi , Assistant Professor, Department of Mathematics, Dr. B. R. Ambedkar Open University, Hyderabad, Telangana, India.

ABSTRACT:

In this paper, we introduce the notion of Partial sub-basic sequence on the sub set of Square-free odd integers and using convolution definition of arithmetic functions from the set of square free positive integers to real numbers and obtain some basic algebraic properties of convolution. We also define Partial Multiplicative Functions with respect to Partial Basic Sequences and obtain their properties. These results are extended the results given in Sridevi [7] relating to the arithmetic functions, thus this paper is a sequel to Sridevi [7].

KEY WORDS: Arithmetic functions, Square-free integers, Square-free odd integers, Convolution, Partial sub-basic sequence, Partial multiplicative functions.
2010 MSC : 97F60, 11A25

1. INTRODUCTION

A real or complex valued function defined of the set of all natural numbers or the set of all positive integers is called an arithmetical function. Their various properties were investigated by several authors and they represent an important research topic [1, 2, 3, 4]. Properties of $\mathcal{B}$ - Multiplicative and Quasi $\mathcal{B}$ - multiplicative functions are studied in [5, 6].

Sridevi [7] considered the set Å of square-free integers and defined partial multiplication with respect to partial operator $*$ on Å × Å. In [7] a partial basic sequence of Å × Å satisfying three properties is introduced. In this paper, we introduce partial sub-basic sequence and convolution operator $\circ$ on partial basic sequence. Using this convolution, we establish some algebraic results of arithmetic functions. We also introduce the notion of partial multiplicative functions and study their properties. This paper is sequel to Sridevi [7].

2. PRELIMINARIES

Let $\mathbb{Z}^+$ be the set of all positive integers.

Define $\text{Å} = \{n \in \mathbb{Z}^+ | n \text{ is square} - \text{free}\}$ (i.e., p is a prime, $p|n \implies p^2 \dagger n$). Clearly $1 \in \text{Å}$.

Sridevi [7] introduced the notion of partial binary operator on Å and partial basic sequence on Å as follows.

Let $*$ be the partial binary operator defined on Å as follows.

For $m, n \in \text{Å}$, $m * n = mn$ whenever $(m, n) = 1$.

We observe that $m * n$ is not always defined but it is defined only when $(m, n) = 1$. (i.e., gcd of $m, n = 1$).

Let F be the sub set of Å × Å such that $(m, n) \in \text{F}$ if $(m, n) = 1$.

Thus $\text{F} = \{(m, n) | m, n \in \text{Å}, (m, n) = 1\}$.

We observe that $m * n$ is defined if $(m, n) \in \text{F}$.

F has the following properties:

(i) $(a, b) \in \text{F} \Leftrightarrow (b, a) \in \text{F}$

(ii) Suppose $a, b, c \in \text{Å}$. Then $(a, bc) \in \text{F} \Leftrightarrow (a, b) \in \text{F}, (a, c) \in \text{F}$ and $(b, c) = 1$.

(iii) $(1, a) \in \text{F}$ for all $a \in \text{Å}$.

F is called partial basic sequence on Å.

3. RESULTS

Let $\dot{\text{B}} = \{m \in \mathbb{Z}^+ | m \text{ is square} - \text{free odd integer}\}$

Then clearly $\dot{\text{B}}$ is a proper subset of Å.

Write $\text{F}_{\dot{\text{B}}} = \{(m, n) | m, n \in \dot{\text{B}}, (m, n) = 1\}$.

EXAMPLES OF PARTIAL SUB-BASIC SEQUENCES OF SQUARE-FREE INTEGERS AND ALGEBRAIC PROPERTIES OF CONVOLUTION OF ARITHMETIC FUNCTIONS

Dr. K. Sridevi , Assistant Professor, Department of Mathematics, Dr. B. R. Ambedkar Open University, Hyderabad, Telangana, India.

ABSTRACT:

In this paper, we give examples of partial sub-basic sequences on the sub set of square-free integers and using convolution definition of arithmetic functions obtain some basic algebraic properties. We obtain some properties of Partial Multiplicative Functions with respect to Partial Sub-basic Sequences. These results extend the results given in Sridevi [7, 8] related to the arithmetic functions, thus this paper is sequel to Sridevi [7, 8].

KEY WORDS: Arithmetic functions, Square-free integers, Square-free odd integers, Convolution, Partial sub-basic sequences, Partial multiplicative functions.
2010 MSC : 97F60, 11A25

1. INTRODUCTION

A real or complex valued function defined of the set of all natural numbers or the set of all positive integers is called an arithmetical function. Their various properties were investigated by several authors and they represent an important research topic [1, 2, 3, 4]. Properties of $\mathcal{B}$-Multiplicative and Quasi $\mathcal{B}$-Multiplicative functions are studied in [5, 6].

Sridevi [7] considered the set Å of square-free integers and defined partial multiplication with respect to partial operator $*$ on Å × Å. In [7] a partial basic sequence of Å × Å satisfying three properties is introduced. Sridevi [8] also introduced partial sub basic sequence and convolution operator $\circ$ on partial basic sequence, established some algebraic results of arithmetic functions and also introduced the notion of partial multiplicative functions and studied their properties. In this paper, we give examples of partial sub-basic sequences on the sub set of square-free integers. Using convolution definition of arithmetic functions, we obtain some basic algebraic properties. This is a sequel to Sridevi [7, 8].

2. PRELIMINARIES

Let $\mathbb{Z}^+$ be the set of all positive integers.

Define $\text{Å} = \{n \in \mathbb{Z}^+ | n \text{ is squarefree}\}$ $(\text{i.e.}, p \text{ is a prime}, p|n \implies p^2 \nmid n)$. Clearly $1 \in \text{Å}$.

Sridevi [7] introduced the notion of partial binary operator on Å and partial basic sequence on Å as follows.

Let $*$ be the partial binary operator defined on Å as follows:

For $m, n \in \text{Å}$, $m * n = mn$ whenever $(m, n) = 1$.

We observe that $m * n$ is not always defined , but it is defined only when $(m, n) = 1$.
$(\text{i.e., gcd of } m, n = 1)$.

Let F be the sub set of Å × Å such that $(m, n) \in \text{F}$ if $(m, n) = 1$.

Thus $\text{F} = \{(m, n) | m, n \in \text{Å}, (m, n) = 1\}$.

We observe that $m * n$ is defined if $(m, n) \in \text{F}$.

F has the following properties:

(i) $(a, b) \in \text{F} \Leftrightarrow (b, a) \in \text{F}$

(ii) Suppose $a, b, c \in \text{Å}$. Then $(a, bc) \in \text{F} \Leftrightarrow (a, b) \in \text{F}, (a, c) \in \text{F}$ and $(b, c) = 1$

(iii) $(1, a) \in \text{F}$ for all $a \in \text{Å}$.

F is called partial basic sequence on Å.

Sridevi [8] introduced the notion of partial sub-basic sequence on the sub set of square-free odd integers.

$\dot{\text{B}} = \{m \in \mathbb{Z}^+ | m \text{ is square} - \text{free odd integer}\}$

Then clearly $\dot{\text{B}}$ is a proper subset of Å.

Write $\text{F}_{\dot{\text{B}}} = \{(m, n) | m, n \in \dot{\text{B}}, (m, n) = 1\}$.

$\text{F}_{\dot{\text{B}}}$ has the following properties:

(i) $(a, b) \in \text{F}_{\dot{\text{B}}} \Leftrightarrow (b, a) \in \text{F}_{\dot{\text{B}}}$

(ii) Suppose $a, b, c \in \dot{\text{B}}$. Then $(a, bc) \in \text{F}_{\dot{\text{B}}} \Leftrightarrow (a, b) \in \text{F}_{\dot{\text{B}}}, (a, c) \in \text{F}_{\dot{\text{B}}}$ and $(b, c) = 1$

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 2, 2022, p. 3600-3609
https://publishoa.com
ISSN: 1309-3452

Transcendental representation of Diophantine Equation $x^n + y^n = z^n$ to Generate At most All Pythagorean and Reciprocal Pythagorean Triples

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Received: 2022 March 25; Revised: 2022 April 28; Accepted: 2022 May 15

Abstract:
This paper revisits one of the Diophantine Equations $x^n + y^n = z^n$ And its transcendental representation $\left(\frac{z}{y}\right)^{\frac{n}{2}} = 1 + \frac{2}{x^2-1}$. By substituting **n=2**, the quadratic Diophantine equation satisfies Pythagorean Theorem. This paper introduced to a generation of all primitive and Nonprimitive Pythagorean triples for each positive integer 'x '. By substituting **n = -2** in the above Diophantine equation it satisfies the Reciprocal Pythagorean Theorem $\frac{1}{x^2} + \frac{1}{y^2} = \frac{1}{z^2}$. Also verified each Pythagorean Triple (a, b, c) is generates Reciprocal Pythagorean Triple (ac, bc, ab) .
Apply this corollary to generate Set of Reciprocal Pythagorean Triples RPT=.$\left\{(a\,,b,c): \frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}\right\}$. Also, verified each p=(a, b, c) ∈ RPT, $h = \frac{ab}{c}$ **(Also, c =** $\frac{ab}{h}$**);** **h =** $\sqrt{c_a c_b}$; $a^2 = c_a.c$; $b^2 = c_b.c$; **c = 2R; r =** $\frac{a+b-c}{2}$;
$sin_{RPT}(\theta_1)=\frac{h}{a}$, $sin_{RPT}(\theta_2)=\frac{h}{b}$, $cos_{RPT}(\theta_1)=\frac{c_a}{a}$, $cos_{RPT}(\theta_2)=\frac{c_b}{b}$, $Tan_{RPT}(\theta_1)=\frac{h}{c_a}$, $Tan_{RPT}(\theta_2)=\frac{h}{c_b}$
with $\theta_1 + \theta_2=\frac{\pi}{2}$**.**

Introduction

The solutions to the quadratic Diophantine equation P= =.$\{(x\,,y,z): x^2 + y^2 = z^2\}$ are given by the Pythagorean theorem. While several methods are exploded to generate Pythagorean triples with repetition, two of them are represented below. **Also, we are proposed one of the methods to generate the Pythagorean triples without repetition for each positive integer.**

Corollary 1: G = $\{(4m\,, 4m^2 - 1\,, 4m^2 + 1) : \mathit{for\ some\ integer}\ m\}$ is a subset of P.

Proof: Consider Reciprocal Summation of two consecutive odd number, which is equal to $\frac{a}{b}$ and c = b + 2 can become Pythagorean Triple (a , b, c) , which is $\frac{1}{2m-1} + \frac{1}{2m+1} = \frac{4m}{4m^2-1}$ implies the result $(4m\,, 4m^2 - 1\,, 4m^2 + 1)$ becomes to Pythagorean primitive Triple for m = 1,2 ,3,4,……,because of above triple can Satisfies statement of Pythagorean Theorem $(4m)^2 + (4m^2 - 1)^2 = (4m^2 + 1)^2$.

It proves that **S =** $\{(4m\,, 4m^2 - 1\,, 4m^2 + 1) : \mathit{for\ some\ integer}\ m\}$ is a subset of P.

Corollary 2: K = $\{\,(2n + 1, 2n(n + 1), 2n(n + 1) + 1)) : \mathit{for\ some\ integer}\ n\}$ is a subset of P.

Proof: Consider Reciprocal Summation of two consecutive even numbers which is equal to $\frac{a}{b}$ and c = b + 1 can become Pythagorean Triple (a , b, c) , which is $\frac{1}{2n} + \frac{1}{2(n+1)} = \frac{2n+1}{2n(n+1)}$ implies the result

$(2n + 1, 2n(n + 1), 2n(n + 1) + 1))$ is becomes to Pythagorean Triple for n = 1, 2,3,4,….

It proves that **K =** $\{\,(2n + 1, 2n(n + 1), 2n(n + 1) + 1)) : \mathit{for\ some\ integer}\ n\}$ is a subset of P.

Limitations on Existing Results to generate Pythagorean Triples:

1) Euclid's Method generates Pythagorean Triples only for odd integers.

EXTREMAL HYPERGRAPH THEORY BASED ON NON-PRINCIPAL FAMILIES

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Abstract: Graph Theory is one of the best known, popular and extensively researched subject, having many applications and conjectures, which are still open and studied by various mathematicians and computer scientists along the world.Now a days the role of graph theory in various filed is increasing, currently it provide greater functionality, combination, and low cost system into real world designed systems. Graph theory is in spot to play extensive roles in real application. In different fields the field of mathematics plays a key role. In mathematics, graph theory is one of the important fields used in structural models. This structural structure of different objects or technologies leads to new developments and changes in the current world in these areas. In this paper extremal hyper graph theory based on non principal families. A family F of k-graphs is called non-principal if its Turan density is strictly smaller than that of each individual member. For each k ≥ 3 we find two (explicit) k-graphs F and G such that {F, G} is non-principal. Our proofs use stability results for hyper graphs.

KEY WORDS: Extremal Hyper Graph, Mathematics, Non-Principal Families, Turan density.

I.INTRODUCTION

A diagram consisting of many points and lines that unite several pairs of these points can be easily represented for several real-world contexts. The points might, for example, show individuals with lines who join couples with friends; or the points could be contact centers with lines showing connection connections. Notice that one is primarily concerned in such diagrams whether a line connects two defined points or not; the way they are connected is immaterial [1]. The definition of a graph is a statistical abstraction of conditions of this kind.

Graph theory principles are commonly used in various fields to research and model different applications [2]. This includes studying molecules, building chemical bonds and studying atoms. In sociology, for instance, graph theory is used to calculate the popularity of actors or to investigate processes of diffusion.

The theory of graphs is used for biodiversity and conservation, where a vertex represents areas in which some species live and where edges represent migratory or moving paths between areas. This data is important for examining the breeding habits of disease, parasites and for investigating the effect of migration on other animals. This knowledge is important. In the field of computer science, graph theory concepts are widely used [3]. The graph theory uses algorithms such as Breadth First Search, Depth First Search, Topological Sort, BellmanFord, the algorithme of Dijkstra, Minimum Trees, the Algorithm of Kruskal and the Prim's.

Graphs consist of points called vertices, lines called edges, Edges connect two vertices, Edges only intersect at vertices and Edges joining a vertex to itself are called

AJMI Vol.08 Issue-02, (July - December, 2016) ISSN: 2394-9309
Aryabhatta Journal of Mathematics and Informatics (Impact Factor- 4.866)

SOME PROPERTIES OF $\mathcal{B}$ - MULTIPLICATIVE AND QUASI - $\mathcal{B}$ - MULTIPLICATIVE FUNCTIONS

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ABSTRACT

An arithmetical function f is said to be multiplicative if f is not identically zero and $f(mn) = f(m)\, f(n)$ whenever $(m, n) = 1$ and f is said to be completely multiplicative if $f(mn) = f(m)\, (n)$ for all m, n.

Definition : By a basic sequence $\mathcal{B}$, we mean a set of pairs (a, b) of positive integers such that :

1. $(a, b) \in \mathcal{B} \Leftrightarrow (b, a) \in \mathcal{B}$
2. $(a, bc) \in \mathcal{B} \Leftrightarrow (a, b) \in \mathcal{B}$ and $(a, c) \in \mathcal{B}$
3. $(1, k) \in \mathcal{B}$ for $k = 1, 2, 3$ …..

We define $\mathcal{B}$ - multiplicative functions as follows :

Definition : An arithmetical function f is said to be $\mathcal{B}$ - multiplicative if f is not identically zero and $f(mn) = f(m) f(n)$ for all $(m, n) \in \mathcal{B}$.

We have already proved that if f and g are $\mathcal{B}$ - multiplicative then their Dirichlet product $f * g$ and their unitary product $f \times g$ are also $\mathcal{B}$ - multiplicative.

We have $(f \circ_{\mathcal{B}} g)(n) = \sum_{\substack{cd = n \\ (c, d) \in \mathcal{B}}} f(c)\ g(d)$

Definition : An arithmetical function f is said to be Quasi - $\mathcal{B}$ - multiplicative if $f(1) \neq 0$ and $f(1) f(mn) = f(m) f(n)$ for all $(m, n) \in \mathcal{B}$

IJMS, *Vol. 15, Nos. 3-4, (July-December 2016)*

ISSN: 0972-754X

SOME PROPERTIES OF $\mathcal{B}$-MULTIPLICATIVE FUNCTIONS OF ONE VARIABLE AND TWO VARIABLES

K. Sridevi

Abstract: By a basic sequence B we mean a set of pairs (a, b) of positive integers with the properties

1. $(a, b) \in \mathcal{B} \Leftrightarrow (b, a) \in \mathcal{B}$
2. $(a, bc) \in \mathcal{B} \Leftrightarrow (a, b) \in \mathcal{B}$ and $(a, c) \in \mathcal{B}$
3. $(1, k) \in \mathcal{B}$ for $k = 1, 2, 3, \ldots\ldots\ldots$

In this paper we define $\mathcal{B}$ - multiplicative functions.

Definition: An arithmetical function f is said to be $\mathcal{B}$ - multiplicative if f is not identically zero and $f(mn) = f(m) f(n)$ for all $(m, n) \in \mathcal{B}$.

For Example,

Our $\mathcal{B}$ - multiplicative function is the generalization of multiplicative and completely multiplicative functions.

Definition : ($\mathcal{B}$ - multiplicative function of two variables)

$\mathcal{B}$ - multiplicative function in two variables is defined as

$f(mm', nn') = f(m, n) f(m', n')$ for all $(m, n) \in \mathcal{B}$ and $(m', n') \in \mathcal{B}$.

In this paper we have shown the following:

(i) If f and g are $\mathcal{B}$ - multiplicative functions, then their Dirichlet product $f * g$ is also a $\mathcal{B}$ - multiplicative function.

i.e. $(f * g)(mn) = (f * g)(m)(f * g)(n)$ for all $(m, n) \in \mathcal{B}$.

(ii) If f and g are $\mathcal{B}$ - multiplicative functions, then their Unitary product $f \times g$ is also a B - multiplicative function.

i.e. $(f \times g)(mn) = (f \times g)(m)(f \times g)(n)$.

(iii) If f and g are $\mathcal{B}$ - multiplicative functions of two variables m, n then $f o_{\mathcal{B}} g$ is also a $\mathcal{B}$ - multiplicative function of two variables.

$(f\, 0_{\mathcal{B}}\, g)(mm', nn') = (f\, 0_{\mathcal{B}}\, g)(m, n)(f\, 0_{\mathcal{B}}\, g)(m', n')$ for all $(m, n) \in \mathcal{B}$ and $(m', n') \in \mathcal{B}$

We also have shown some more properties of B - multiplicative functions.

Key wards and Phrases: Multiplicative Functions, Completely Multiplicative Functions, Basic Sequence, $\mathcal{B}$ - Multiplicative Functions.

International Journal of Engineering, Science and Mathematics
Vol. 6 Issue 8, December 2017 (Special Issue)
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Common Fixed Point Theorems for Four maps Using Generalized Altering Distance Functions in Seven Variables and Applications to Integral Type Inequalities

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Abstract – Proving existence and uniqueness of fixed points by using generalized altering distance function in complete metric space has nice application. In this paper, we obtain unique common fixed point results for four self mappings by altering distances in seven variables and application to integral type inequalities.

Keywords: Altering distance functions, Sub compatible, generalized altering distance, Integral type inequalities.

2010 MSC: 47H10, 54E35

1. Introduction:

Fixed point theory plays an important role in functional analysis. Fixed point theory beginning from Banach contraction principle of Banach [2] (1922) in complete metric spaces has wider applications in differential and integral equations in mathematical science and engineering. Many authors have extended, generalized and improved Banach's fixed point theorem in different ways and different generalized metric spaces.

The fixed point theorems related to altering distances between points in complete metric spaces have been obtained initially by D. Delbosco [9] and F. Skof [20] in 1977. M. S. Khan et al. [12] initiated the idea of obtaining fixed point of self maps of a metric space by altering distance between the points with the use of a certain continuous control function. K. P. R. Sastry and G. V. R. Babu [18] discussed and established the existence of fixed points for the orbits of single self-maps and pairs of self-maps by using a control function. K. P. R. Sastry et al. [17, 19] proved fixed point theorems in complete metric spaces by using a continuous control function. B. S. Choudhury et al. [7, 8], G. V. R. Babu et al. [3, 4, 5, 6], S. V. R. Naidu [13, 14], K. P. R. Rao et al. [15, 16] proved some common fixed point results by altering distances.

Aliouche [1] proved common fixed point results in symmetric spaces for weakly compatible mappings under contractive condition of integral type. Hesseni [10, 11] used contractive rule of integral type by altering distance and generalized common fixed point results. Mishra et al. [22] proved two common fixed point theorems under contraction rule of integral type in complete metric spaces by altering distance.

The main aim of this paper is to prove the existence and uniqueness of common fixed points of two pairs of sub compatible mappings by using a generalized altering distance function of seven variables and apply them to integral type inequalities. This paper is an extension of our previous result K. Sridevi et al. [21].

2. Preliminaries:

Stochastic Modeling and Applications
Vol. 25 No. 2 (July-December, 2021)
ISSN: 0972-3641

Received: 19th December 2021 *Revised: 27th December 2021* *Selected: 31st December 2021*

A NEW SUBCLASS OF MEROMORPHIC FUNCTIONS WITH POSITIVE COEFFICIENTS DEFINED BY INTEGRAL OPERATOR

K. SRIDEVI AND T. SWAROOPA RANI

ABSTRACT. The target of this article is acquire coefficient bounds, radii of starlikeness and convexity, convex linear combinations, integral transforms and neighborhood results for the subclass positive coefficient meromorphic functions.

1. Introduction

Let Σ indicate the class of meromorphic functions of the form

$$\eta(w) = \frac{1}{w} + \sum_{n=1}^{\infty} \ell_n w^n \tag{1.1}$$

which are regular in the punctured unit disc

$$U^* = \{w : w \in C \text{ and } 0 < |w| < 1\} = U \setminus \{0\}.$$

A function $\eta \in \Sigma$ is given by (1.1) is said to be meromorphically starlike and meromorphically convex of order ϖ if it delights the pursing

$$-\Re\left\{\frac{w\eta'(w)}{\eta(w)}\right\} > \varpi, \; (w \in U) \tag{1.2}$$

$$\text{and} \quad -\Re\left\{1 + \frac{w\eta''(w)}{\eta'(w)}\right\} > \varpi, \; (w \in U) \tag{1.3}$$

for some ϖ, $(0 \le \varpi < 1)$ respectively and we say that η is in the class $\Sigma^*(\varpi)$ and $\Sigma_c(\varpi)$ of such functions respectively.

The class $\Sigma^*(\varpi)$ and different subclasses of Σ have been examined broadly by researchers [1, 6, 8, 9]. Over the few years, numerous authors have explored the subclass of positive coefficient meromorphic functions. Juneja and Reddy [3] discussed the Σ_p function of the form

$$\eta(w) = \frac{1}{w} + \sum_{n=1}^{\infty} \ell_n w^n, \; (\ell_n \ge 0), \tag{1.4}$$

which are regular and univalent in U^*. The functions of this class are called to be meromorphic function with a positive coefficients. Jung et al. [4] defined the

2010 *Mathematics Subject Classification.* 30C45.
Key words and phrases. analytic,starlike,coefficient bounds, convexity,neighbourhood.

ARTICLE IN PRESS

Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Transcendental representation of Diophantine equation and some of its inherent properties

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ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Diophantine equation
Pythagorean theorem
Pythagorean primitives Triples
Fermat's Last theorem

ABSTRACT

We know that Diophantine equations are polynomial equations with integer coefficients and they are having integer solutions. In this paper we are revisits one of the Diophantine Equation $x^n + y^n = z^n$in different perspective, to study some of its inherent properties. In this paper we are proven transcendental representation of above Diophantine equations is $\left(\frac{z}{y}\right)^{\frac{n}{2}} = 1 + \frac{2}{x^2-1}$. By substituting n = 2, the quadratic Diophantine equation is satisfies Pythagorean theorem, which is having transcendental representation $\frac{z}{y} = 1 + \frac{2}{x^2-1}$. Also we are finding all primitive and non primitive Pythagorean triples by choosing of x value from following four disjoint Sets (whose union is becomes to Set of all positive integers).

A = $\left\{(x, y, z) : \frac{z}{y} = 1 + \frac{2}{x^2-1} \textit{if x is odd prime number or its powers}\right\}$

B = $\left\{(x, y, z) : \frac{z}{y} = 1 + \frac{2}{\left(\frac{x}{(2p-1)^2}\right)^2 - 1} \textit{ if x is odd composite and its powers, for some } p = 1, 2, 3..\right\}$

C = $\left\{(x, y, z) : \frac{z}{y} = 1 + \frac{2}{\left(\frac{x}{2}\right)^2 - 1} \textit{if x is geometric power of } 2\right\}$

D=$\left\{(x, y, z) : \frac{z}{y} = 1 + \frac{2}{\left(\frac{x}{2p^2}\right)^2 - 1} \textit{if x is even composite but not geometric power of} 2, \textit{for some } p = 1, 2, 3 \cdots\right\}$.

And with using of programming coding of 'c' language for above transcendental representation of Diophantine equation,we are proven Fermat's Last Theorem for n > 2.

1. Introduction

We know that Diophantine equations are polynomial equations with integer coefficients and they are having integer solutions.

Case 1: TRANSCENDENTAL REPRESENTATION OF DIOPHANTINE EQUATION

Consider the Diophantine equation $x^n + y^n = z^n$.

Now we can solve for integer solution for above Diophantine equation.

$\left(x^{\frac{n}{2}}\right)^2 + \left(y^{\frac{n}{2}}\right)^2 = \left(z^{\frac{n}{2}}\right)^2$implies that $\left(x^{\frac{n}{2}}\right)^2 = \left(z^{\frac{n}{2}}\right)^2 - \left(y^{\frac{n}{2}}\right)^2$

follows that 1 =$\frac{\left(z^{\frac{n}{2}}+y^{\frac{n}{2}}\right)\left(z^{\frac{n}{2}}-y^{\frac{n}{2}}\right)}{\left(x^{\frac{n}{2}}\right)^2}$, implies that 1 = $\left(\frac{z^{\frac{n}{2}}+y^{\frac{n}{2}}}{x^{\frac{n}{2}}}\right)\left(\frac{z^{\frac{n}{2}}-y^{\frac{n}{2}}}{x^{\frac{n}{2}}}\right)$

Consider above factors are reciprocals to each other with some positive integers x, y, z.

Without losing the generality, For some two positive odd integers a, b (a must be multiple of b),we can go to assume $\frac{z^{\frac{n}{2}}+y^{\frac{n}{2}}}{x^{\frac{n}{2}}} = \frac{a}{b}, \frac{z^{\frac{n}{2}}-y^{\frac{n}{2}}}{x^{\frac{n}{2}}} = \frac{b}{a}$,

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https://doi.org/10.1016/j.matpr.2021.05.619
2214-7853/

Please cite this article as: K Sridevi and T. Srinivas, Transcendental representation of Diophantine equation and some of its inherent properties, Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.2021.05.619