

International Journal of Statistics and Applied Mathematics

ISSN: 2456-1452
 Maths 2017; 2(6):301-302
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 www.mathsjournal.com
 Received: 26-09-2017
 Accepted: 29-10-2017

P Saranya
 Assistant Professor,
 Department of Mathematics,
 Cauvery College for Women,
 Trichy, Tamil Nadu, India

G Janaki
 Associate Professor, Department
 of Mathematics, Cauvery College
 for Women, Trichy, Tamil Nadu,
 India

Construction of Gaussian Diophantine triples with the property D (25)

P Saranya and G Janaki

Abstract

We search for Gaussian Diophantine triples with the property D(25) and we present 11 general sets of Gaussian Diophantine triples with the property D(25).

Keywords: Diophantine triples, Gaussian integer

Introduction

The Gaussian integer $z[i]$ is the simplest generalization of ordinary integer Z and they behave in much the same way. This was first introduced by Carl Friedrich Gaussian in his second monograph on quartic reciprocity in the year 1832. In particular $z[i]$ enjoys unique prime factorization and this allows us reason $z[i]$ as the same way we do about Z .

For basics and ideas ^[1-3] has been studied. For various ideas on triples and quadruples ^[4-13] has been referred. ^[14, 15] has been studied for ideas on Gaussian Diophantine quadruples.

Recently in ^[16, 17] Special dio 3-tuples are constructed from $\frac{CC_n}{Gno_n}$

In this paper search for Gaussian Diophantine triples with the property D(25) and we present 11 general sets of Gaussian Diophantine triples with the property D(25).

Definition

Gaussian integers are defined as $z[i] = \{a + ib \mid a, b \in Z\}$

A sequence of non-negative integers is said to be Diophantine m-triple if each $a_i a_j + 1$ ($i \neq j$) is the square of an integer.

A Diophantine 3-triple is also known as Diophantine triples.

Method of Analysis

Let $a = kp + 1 + ikq$; $b = kp + 11 + ikq$ be two Gaussian integers.

$$\text{We have } ab + 25 = \alpha^2 \tag{1}$$

$$\text{where } \alpha = kp + 6 + ikq$$

Hence (a,b) is a Gaussian Diophantine double with the property D(25)

Introduce c such that c is any non-zero Gaussian Integer with the property.

$$ac + 25 = \beta^2 \tag{2}$$

$$bc + 25 = \gamma^2 \tag{3}$$

Taking $\beta = a + \alpha$ and $\gamma = b + \alpha$, we have from (2) and (3)

$$c = 4kp + 24 + i4kq$$

Thus we have the Gaussian Diophantine triples $\{kp + 1 + ikq, kp + 11 + ikq, 4kp + 24 + i4kq\}$ with the property D(25) for any $k > 0$.

Correspondence

P Saranya
 Assistant Professor,
 Department of Mathematics,
 Cauvery College for Women,
 Trichy, Tamil Nadu, India

In the following table we present 10 sets of Gaussian Diophantine triples with the property D (25)

S. No	a	B	C
1	$kp - 1 + ikq$	$kp + 9 + ikq$	$4kp + 16 + i4kq$
2	$kp - 2 + ikq$	$kp + 8 + ikq$	$4kp + 12 + i4kq$
3	$kp - 3 + ikq$	$kp + 7 + ikq$	$4kp + 8 + i4kq$
4	$kp - 4 + ikq$	$kp + 6 + ikq$	$4kp + 4 + i4kq$
5	$kp - 6 + ikq$	$kp + 4 + ikq$	$4kp - 4 + i4kq$
6	$kp - 7 + ikq$	$kp + 3 + ikq$	$4kp - 8 + i4kq$
7	$kp - 8 + ikq$	$kp + 2 + ikq$	$4kp - 24 + i4kq$
8	$kp - 9 + ikq$	$kp + 1 + ikq$	$4kp - 16 + i4kq$
9	$kp - 12 + ikq$	$kp - 2 + ikq$	$4kp - 28 + i4kq$
10	$kp + 2 + ikq$	$kp + 12 + ikq$	$4kp + 28 + i4kq$

Conclusion

In this paper we have presented 11 sets of Gaussian triples with the property D(25). One may also search for similar Gaussian triples with suitable property.

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