Pythagorean numbers and Fermat's Last Theorem proof

[Leejaeyul and Leeyoujin]

Abstract

The Pythagorean Theorem and the Pythagorean numbers are well known things. In the equation $X^2+Y^2=Z^2$, the numbers of X, Y, Z can be the natural numbers known as the Pythagorean numbers. But anybody seemed not analyze the imperfect forms about the Pythagorean numbers carefully. In the equation $X^n+Y^n=Z^n$, when n be greater or equal 3, the equation can not have non zero integer solutions. The fact was also well known thing as the Fermat's Last Theorem. The Fermat had written what he found out the proof. But anybody could not find out his proof, so nobody could know his proof. We have considered A=Z−Y, B=Z−X in the equation and found out one new form about the Pythagorean numbers and a new simple and plain proof about the Fermat's Last Theorem.

Sentence

1. Preface

In the equation $X^n+Y^n=Z^n$, n be the natural numbers. When n=1, the equation be X+Y=Z. When n=2, the equation be $X^2+Y^2=Z^2$ and the numbers of X, Y, Z can become the natural numbers known as the Pythagorean numbers. But when n be greater or equal 3, the equation $X^n+Y^n=Z^n$ can not have non zero integers solutions. That is known as the Fermat's Last Theorem.

2. General

2-1. It is generally acknowledged to be true what the equation $X^n+Y^n=Z^n$ can not have non zero integer solutions and what the equation $X^n+Y^n=Z^n$ can not have non zero natural number solutions are equivalent in meaning.

2-1-1. When n be even numbers, what the equation $X^n+Y^n=Z^n$ can not have non zero integer solutions and what the equation $X^n+Y^n=Z^n$ can not have non

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Key Words and Phrases

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Y+A=X+B=Z. X−A=Y−B=Z−A−B=X+Y−Z

$G=(X-A)/(AB)^{1/n}=(Y-B)/(AB)^{1/n}=(Z-A-B)/(AB)^{1/n}=(X+Y-Z)/(AB)^{1/n}$

$X=G(AB)^{1/n}+A$, $Y=G(AB)^{1/n}+B$, $Z=G(AB)^{1/n}+A+B$

$\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$

$X+Y-Z=G(AB)^{1/n}=q[\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}/2]\{(A^{n-1}B)^{1/n}+(AB^{n-1})^{1/n}\}$

zero natural number solutions are equivalent in meaning.

When n be even numbers

and U, V, W are natural numbers,

$(-U)^n+V^n=W^n$

$U^n+V^n=W^n$

2-1-2. When n be odd numbers, what the equation $X^n+Y^n=Z^n$ can not have non zero integer solutions and what the equation $X^n+Y^n=Z^n$ can not have non zero natural number solutions are equivalent in meaning.

When n be odd numbers

and U, V, W are natural numbers,

$(-U)^n+V^n=W^n$

$-U^n+V^n=W^n$

$W^n+U^n=V^n$

2-2. Therefore what the equation $X^n+Y^n=Z^n$ can not have non zero integer solutions be what the equation $X^n+Y^n=Z^n$ can not have non zero natural number solutions.

3. Introduction

3-1. In the equation $X^n+Y^n=Z^n$, the mutual relation forms between A, B and X, Y, Z are A=Z−Y, B=Z−X, Y+A=X+B=Z, $X-A=Y-B=Z-A-B=X+Y-Z=G(AB)^{1/n}$, $\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$, etc.

In the equation

$X^n+Y^n=Z^n$

the numbers of X, Y, Z be regarded as non zero natural numbers.

Y+A=X+B=Z

The numbers of A, B must become non zero natural numbers.

A=Z−Y, B=Z−X

Therefore

X−A=Y−B=Z−A−B=X+Y−Z

So

$(X-A)/(AB)^{1/n}=(Y-B)/(AB)^{1/n}=(Z-A-B)/(AB)^{1/n}=(X+Y-Z)/(AB)^{1/n}$

This be G.

$G=(X-A)/(AB)^{1/n}=(Y-B)/(AB)^{1/n}=(Z-A-B)/(AB)^{1/n}=(X+Y-Z)/(AB)^{1/n}$

And

$$X=G(AB)^{1/n}+A,\ Y=G(AB)^{1/n}+B,\ Z=G(AB)^{1/n}+A+B$$

Therefore

$$X+Y-Z=G(AB)^{1/n}$$

and

$$\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$$

3-2. When n=1, G=0 and when n=2, $G=2^{1/2}>0$ but when n=3, G=F(A,B)>0

3-2-1. When n=1, G=0

$$G(AB)^{1/n}=0$$

$$(0+A)+(0+B)=(0+A+B)$$

$$X=A,\ Y=B,\ Z=A+B$$

3-2-2. When n=2, $G=2^{1/2}$

$$G(AB)^{1/n}=(2AB)^{1/2}$$

$$\{(2AB)^{1/2}+A\}^2+\{(2AB)^{1/2}+B\}^2=\{(2AB)^{1/2}+A+B\}^2$$

$$X=(2AB)^{1/2}+A,\ Y=(2AB)^{1/2}+B,\ Z=(2AB)^{1/2}+A+B$$

4. Pythagorean numbers form

4-1. This be one new form about the Pythagorean numbers.

$$X=(2AB)^{1/2}+A,\ Y=(2AB)^{1/2}+B,\ Z=(2AB)^{1/2}+A+B$$

4-1-1. A=Z-Y, B=Z-X

4-1-2. $X-A=Y-B=Z-A-B=X+Y-Z=(2AB)^{1/2}$

4-1-3. X, Y, Z, A, B are all natural numbers.

4-2. These were 3 imperfect forms about the Pythagorean numbers.

First

$$X=2A+1,\ Y=2A^2+2A,\ Z=2A^2+2A+1$$

Second

$$X=4A,\ Y=4A^2-1,\ Z=4A^2+1$$

Third

$$X=A^2-B^2,\ Y=2AB,\ Z=A^2+B^2$$

4-2-1. The inducement of the forms be uncertain.

4-2-2. The mutual relation forms between A, B and X, Y, Z are uncertain.

4-2-3. The irrational numbers of A, B are needed for some numbers of X, Y, Z as the Pythagorean numbers.

4-2-4. The changed forms between X and Y are needed for some numbers of X, Y, Z as the Pythagorean numbers.

5. Fermat's Last Theorem proof

5-1. In the equation $X^n+Y^n=Z^n$, when n be greater or equal 3, the equation be $\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$

When n be greater or equal 3

$X^n+Y^n=Z^n$

A=Z−Y, B=Z−X

$X+Y-Z=G(AB)^{1/n}>0$

$\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$

G=F(A,B)>0

One G=F(A,B) has the positive numbers

but (n−1) each G=F(A,B) have the non positive numbers.

5-2. When A=B, G=F(A)=F(B). This be one positive irrational numbers G.

$G=F(A)=\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}A^{(n-2)/n}$

In

$\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$

When A=B

$2\{G+A^{(n-2)/n}\}^n=\{G+2A^{(n-2)/n}\}^n$

(n−1) each G=F(A) have the non positive irrational numbers

but one G=F(A) has the positive irrational numbers.

This be one positive irrational numbers G.

$G=F(A)=\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}A^{(n-2)/n}$

5-3. One positive numbers G=F(A,B) and $G(AB)^{1/n}=F(A,B)(AB)^{1/n}$

We can divide and multiply by

$2\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}\{A^{(n-2)/n}+B^{(n-2)/n}\}$

to one positive numbers G=F(A,B)

Therefore

$q=2F(A,B)/\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}\{A^{(n-2)/n}+B^{(n-2)/n}\}$

$G=q[\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}/2]\{A^{(n-2)/n}+B^{(n-2)/n}\}$

When A=B, q must become 1.

And

$q=2(X+Y-Z)/\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}\{(A^{n-1}B)^{1/n}+(AB^{n-1})^{1/n}\}$

$X+Y-Z=G(AB)^{1/n}=q[\{2^{(n-1)/n}+\cdots+2^{2/n}+2^{1/n}\}/2]\{(A^{n-1}B)^{1/n}+(AB^{n-1})^{1/n}\}$

$X+Y-Z=G(AB)^{1/n}>0$ must become the irrational numbers

in all natural numbers (A,B).

The reason is this (5-3-1).

5-3-1. If $X+Y-Z=G(AB)^{1/n}$ be the natural numbers, q must become the irrational numbers by all natural numbers (A,B). But in all natural numbers (A,B), q must become the natural numbers as 1, when A=B. That be an apparent contradiction. Therefore $X+Y-Z=G(AB)^{1/n}$ must become the irrational numbers.

5-4. Therefore when n be greater or equal 3, the equation $X^n+Y^n=Z^n$ can not have non zero natural number solutions.

6. Conclusion

Consequently, in the equation $X^n+Y^n=Z^n$

When n=1, $X+Y-Z=0$

the numbers of X, Y, Z can become non zero integers.

When n=2, $X+Y-Z=(2AB)^{1/2}$

the numbers of X, Y, Z can become non zero integers.

But

when n be greater or equal 3, $X+Y-Z=G(AB)^{1/n}$

the numbers of X, Y, Z can not become non zero integers.

End.

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$$X^n+Y^n=Z^n$$

$$(X^{n/2})^2+(Y^{n/2})^2=(Z^{n/2})^2$$

$$A=Z^{n/2}-Y^{n/2},\ B=Z^{n/2}-X^{n/2}$$

$$X^{n/2}=(2AB)^{1/2}+A,\ Y^{n/2}=(2AB)^{1/2}+B,\ Z^{n/2}=(2AB)^{1/2}+A+B$$

$$X^{n/2}Y^{n/2}=3AB+(A+B)(2AB)^{1/2}$$

$$(XY)^n=2A^3B+2AB^3+13(AB)^2+6AB(A+B)(2AB)^{1/2}$$

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