All Pythagorean Triplets and FLT proof

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Abstract

The Pythagorean triplets are the natural number solutions to the Pythagorean Theorem, $X^2+Y^2=Z^2$. The Fermat's Last Theorem states that $X^n+Y^n=Z^n$ has no non-zero integer solutions for (X,Y,Z), when n>2. We have got $\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$, in A=Z-Y and B=Z-X. And we have found out that all Pythagorean triplets cannot be the power numbers. So we have discovered the proof of the Fermat's Last Theorem.

Sentence

1. Preface

In X+Y=Z, every natural numbers (X,Y) can make some natural number (Z). In $X^2+Y^2=Z^2$, the natural numbers (X,Y,Z) are the Pythagorean triplets. When n>2, $X^n+Y^n=Z^n$ has no none-zero integer solutions.

2. General

2-1. $X^n+Y^n=Z^n$ has no non-zero integer solutions. This theorem states that $X^n+Y^n=Z^n$ cannot have the natural number solutions.

2-1-1. When the number (n) is the even number, $(-U)^n+V^n=W^n$, $U^n+V^n=W^n$.

2-1-2. When the number (n) is the odd number, $(-U)^n+V^n=W^n$, $-U^n+V^n=W^n$, $W^n+U^n=V^n$.

2-2. When $X^n+Y^n=Z^n$ can have some natural number solutions, the natural numbers (X,Y) need to be co-prime. Because, when $U^n+V^n=W^n$, U=QX, V=QY, $(QX)^n+(QY)^n=W^n$ and W/Q=Z, in co-prime (X,Y), we get $X^n+Y^n=Z^n$.

3. Introduction

3-1. We can get $\{G(AB)^{1/n}+A\}^n+\{G(AB)^{1/n}+B\}^n=\{G(AB)^{1/n}+A+B\}^n$, in A=Z-Y and B=Z-X.

In $X^n+Y^n=Z^n$, when A=Z-Y, B=Z-X and X+B=Y+A=Z, we can get X-A=Y-B=Z-A-B=X+Y-Z.

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

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

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

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

3-2-1. When n=1, G=0. X+Y-Z=G(AB)=0 and G=0.

In $\{G(AB)+A\}+\{G(AB)+B\}=\{G(AB)+A+B\}$, we can get G(AB)=0 and G=0.

3-2-2. When n=2, $G=2^{1/2}>0$. $X+Y-Z=G(AB)^{1/2}>0$ and G>0.

In $\{G(AB)^{1/2}+A\}^2+\{G(AB)^{1/2}+B\}^2=\{G(AB)^{1/2}+A+B\}^2$, we can get $G^2(AB)=2AB$ and $G=2^{1/2}>0$.

3-2-3. When n=3, G=Function(A,B)>0. $X+Y-Z=G(AB)^{1/3}>0$ and G>0.

In $\{G(AB)^{1/3}+A\}^3+\{G(AB)^{1/3}+B\}^3=\{G(AB)^{1/3}+A+B\}^3$, we can see G=Function(A,B)>0.

4. Fermat's Last Theorem proof

4-1. In $X^n+Y^n=Z^n$, we can get $X^{n/2}=(2ab)^{1/2}+a$, $Y^{n/2}=(2ab)^{1/2}+b$ and $Z^{n/2}=(2ab)^{1/2}+a+b$.

In $X^n+Y^n=Z^n$ and $(X^{n/2})^2+(Y^{n/2})^2=(Z^{n/2})^2$, we can get $a=Z^{n/2}-Y^{n/2}$ and $b=Z^{n/2}-X^{n/2}$.

Key Words and Phrases

MSC : 11-A99 Number Theory

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

$a=Z^{n/2}-Y^{n/2}$, $b=Z^{n/2}-X^{n/2}$, $(XY)^n=ab\{2a^2+2b^2+13ab+6(a+b)(2ab)^{1/2}\}$.

All Pythagorean triplets cannot be the power numbers.

In $\{G(ab)^{1/2}+a\}^2+\{G(ab)^{1/2}+b\}^2=\{G(ab)^{1/2}+a+b\}^2$, we can get $G=2^{1/2}>0$.

Therefore $X^{n/2}=(2ab)^{1/2}+a$, $Y^{n/2}=(2ab)^{1/2}+b$ and $Z^{n/2}=(2ab)^{1/2}+a+b$.

4-2. When the number (n) is the odd number, $X^n+Y^n=Z^n$ cannot have the natural number solutions, because the numbers (a) or (b), (2ab), $(2ab)^{1/2}$ and $ab\{2a^2+2b^2+13ab+6(a+b)(2ab)^{1/2}\}$ cannot be the natural numbers, in the natural numbers (X,Y,Z).

In $X^n+Y^n=Z^n$ and $(X^{n/2})^2+(Y^{n/2})^2=(Z^{n/2})^2$, we see $a=Z^{n/2}-Y^{n/2}$ and $b=Z^{n/2}-X^{n/2}$.

When the numbers (X,Y,Z) are the natural numbers, the two numbers of $(X^{n/2},Y^{n/2},Z^{n/2})$ can be the natural numbers but the one number of $(X^{n/2},Y^{n/2},Z^{n/2})$ cannot be the natural number, because the number (n) is the odd number. Therefore the number (a) or (b) and the number $ab=(Z^{n/2}-Y^{n/2})(Z^{n/2}-X^{n/2})$ cannot be the natural numbers.

In $X^{n/2}=(2ab)^{1/2}+a$, $Y^{n/2}=(2ab)^{1/2}+b$ and $Z^{n/2}=(2ab)^{1/2}+a+b$, we can get $X^n=a\{a+2b+2(2ab)^{1/2}\}$, $Y^n=b\{2a+b+2(2ab)^{1/2}\}$, $Z^n=a^2+b^2+4ab+2(a+b)(2ab)^{1/2}$ and $(XY)^n=ab\{2a^2+2b^2+13ab+6(a+b)(2ab)^{1/2}\}$.

When the numbers (X,Y,Z) are the natural numbers, in the odd number (n), the numbers X^n, Y^n, Z^n and $(XY)^n$ are the natural numbers, but the numbers $a\{a+2b+2(2ab)^{1/2}\}$, $b\{2a+b+2(2ab)^{1/2}\}$, $a^2+b^2+4ab+2(a+b)(2ab)^{1/2}$ and $ab\{2a^2+2b^2+13ab+6(a+b)(2ab)^{1/2}\}$ cannot be the natural numbers, because the numbers (a) or (b), (2ab) and $(2ab)^{1/2}$ cannot be the natural numbers. This is an apparent contradiction. So $X^n+Y^n=Z^n$ cannot have the natural number solutions, in the odd number (n).

4-3. When the number (n) is the even number, $X^n+Y^n=Z^n$ cannot have the natural number solutions, because all Pythagorean triplets cannot be the power numbers.

4-3-1. All Pythagorean triplets.

In $X^2+Y^2=Z^2$, $A=Z-Y$ and $B=Z-X$, we get $X=(2AB)^{1/2}+A$, $Y=(2AB)^{1/2}+B$ and $Z=(2AB)^{1/2}+A+B$.

The numbers (A,B) are also the natural numbers, when the numbers (X,Y,Z) are the natural numbers. Therefore the natural numbers (X,Y,Z) are all Pythagorean triplets, when $(2AB)^{1/2}=k$.

4-3-2. All Pythagorean triplets cannot be the power numbers.

In $X=(2AB)^{1/2}+A$, $Y=(2AB)^{1/2}+B$ and $Z=(2AB)^{1/2}+A+B$, when $(2AB)^{1/2}=k$, we can get the natural numbers (X,Y,Z), these are all Pythagorean triplets.

When $c^2=A=Z-Y$, $2d^2=B=Z-X$ and $2cd=k$, we can get $X=2cd+c^2$, $Y=2cd+2d^2$ and $Z=2cd+c^2+2d^2$.

In all Pythagorean triplets (X,Y,Z), when the numbers (X,Y), (A,B) and (c,d) are co-prime, the number (YorX) is the even number, the numbers (XorY,Z) are the odd numbers and the number $XY=2cd(c+d)(c+2d)$ cannot be the power number. Therefore all Pythagorean triplets cannot be the power numbers.

Someone will guess that the number $XY=2cd(c+d)(c+2d)=(2efst)^m$ can be the power number like this, when $c=e^m$, $d=2^{(m-1)}f^m$, $c+d=e^m+2^{(m-1)}f^m=s^m$ and $c+2d=e^m+(2f)^m=t^m$. But he is wrong, here.

In $X^2+Y^2=Z^2$, we have got $X=2cd+c^2$, $Y=2cd+2d^2$ and $Z=2cd+c^2+2d^2$.

When $m>1$, in $e^m+(2f)^m=t^m$, we can get $(e^{m/2})^2+\{(2f)^{m/2}\}^2=(t^{m/2})^2$.

In $(e^{m/2})^2+\{(2f)^{m/2}\}^2=(t^{m/2})^2$, we can get $e^{m/2}=2gh+g^2$, $(2f)^{m/2}=2gh+2h^2$ and $t^{m/2}=2gh+g^2+2h^2$, when $g^2=t^{m/2}-(2f)^{m/2}$ and $2h^2=t^{m/2}-e^{m/2}$.

The numbers (e,f) and (g,h) are also co-prime.

So the numbers $e^{m/2}=2gh+g^2$, $(2f)^{m/2}=2gh+2h^2$, $t^{m/2}=2gh+g^2+2h^2$, $e^m=\{2gh+g^2\}^2$, $(2f)^m=\{2gh+2h^2\}^2$, $t^m=\{2gh+g^2+2h^2\}^2$, $e^{1/2}=\{2gh+g^2\}^{1/m}$, $(2f)^{1/2}=\{2gh+2h^2\}^{1/m}$ and $t^{1/2}=\{2gh+g^2+2h^2\}^{1/m}$ are the natural numbers.

In $(e^{m/2})^2+\{(2f)^{m/2}\}^2=(t^{m/2})^2$, when $u=e^{m/2}$, $v=(2f)^{m/2}$ and $w=t^{m/2}$, the power numbers (u,v,w) are also the Pythagorean triplets.

When the Pythagorean triplets (X,Y,Z) can be the power numbers, we need the smaller power numbers (u,v,w) than the power numbers (X,Y,Z). In this way, all Pythagorean triplets cannot be the power numbers.

5. Conclusion

In $X^2+Y^2=Z^2$, we get $X=(2AB)^{1/2}+A$, $Y=(2AB)^{1/2}+B$ and $Z=(2AB)^{1/2}+A+B$. And when $(2AB)^{1/2}=k$, the natural numbers (X,Y,Z) are all Pythagorean triplets and all Pythagorean triplets cannot be the power numbers.

When $n>2$, $X^n+Y^n=Z^n$ cannot have the natural number solutions. This states that $X^n+Y^n=Z^n$ has no non-zero integer solutions.

Acknowledgment

We believe in the Fermat. Fermat wrote that he had discovered a truly remarkable proof which the margin was too small to contain.

And we believe that the space and the matters come into existence, when the numbers come into existence and we also believe that all cosmic materials and lives change but the number theory cannot change now and forever. Thanks.

References

BarryCipra.(1994)."Straightening out nonlinear codes." What`s happening in Mathematical Sciences. pp. 37-40, vol. 2.

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