Direct Proof of Beal's Conjecture

by Roberto Iannone

In 1993, the banker Andrew Beal, fond of number theory, analyzing the Fermat's Last Theorem and generalizing it, formulated the conjecture that the exponents of the powers of the equation, the bases of which are coprime, can be of different degree, provided that the degree of one of the powers is equal to 2. The proof of Beal's conjecture which I propose descends consequently by direct demonstration of the Fermat's Last theorem formulated by me, with the use of the mathematical properties of algebraic equations and inequalities.

Theorem

It is possible to divide a power, with the integer base , of degree p in the sum of two powers, respectively of degree m and n, which has the three bases coprime, only if the degree of the power or one of the powers is equal to 2.

Demonstration

1) - $A^m + B^n = C^p$ **A,B,C** e **m,n,p** are respectively, with integers the bases coprime and the exponents of the powers of the equation > 2. We have that

2) - $\dfrac{A^m + B^n}{C^p} = 1$ and more

$$3) - \frac{A^m}{C^p} > 0 < \frac{1}{2}$$ and also

$$4) - \frac{B^n}{C^p} > 0 > \frac{1}{2}$$ we reising to **1/p** **3)** and **4)** we have

$$5) - \frac{A^{m/p}}{C} > 0 < \left(\frac{1}{2}\right)^{1/p}$$ and yet

$$6) - \frac{B^{n/p}}{C} > 0 > \left(\frac{1}{2}\right)^{1/p}$$ and so adding the **5)** and the **6)**

we have

$$7) - \frac{A^{m/p} + B^{n/p}}{C} > 1 < 2 \left(\frac{1}{2}\right)^{1/p}$$ the value of the second member of **the inequality,**

for any value of p, is always < 2, **therefore it is indeterminate**, **but** for the **Direct Proof of Fermat's LastTheorem, proved by me, being** $A^{m/p} < B^{n/p} < C$, and $A^{m/p} + B^{n/p} > C$, **the second member, equally, is always** < 2, therefore we can **write also that**

8) - $\frac{A^{m/p} + B^{n/p}}{C} > 1 < 2$ and therefore we can write the **equality** of the second members of the inequalities **7)** and **8),** and to find the value of **p** that satisfies them, so we write

9) - $2\left(\frac{1}{2}\right)^{1/p} = 2$ we develop $(2^{p-1})^{1/p} = 2$ we **raise** the first member to **p** that is $[(2^{p-1})^{1/p}]^p = 2$ and we obtain $2^{p-1} = 2$ **if we put** to the esponent $p = 2$ we develop and obtain the **equality** $2=2$;

therefore the exponent $p = 2$ satisfies the **equality** and it is the only exponent that satisfies the **9).** Any other value of $p > 2$ does not satisfy equality **9),** in fact there would be increasing values and therefore greater than **2.**
We have therefore found also the exponent **2** that satisfies the inequalities **7).** From what has been said above, let's now check and proceed with the substituting the exponent **p** with **2** on the second member of inequality **7)** and then we raise the first and second members to the exponent **2** and we have

10)- $\left(\frac{A^{m/2} + B^{n/2}}{C}\right)^2 > 1 < \left[2\left(\frac{1}{2}\right)^{1/2}\right]^2$ we develop and obtain

11) - $\dfrac{A^m + B^n + 2 * A^{m/2} * B^{n/2}}{C^2} > 1 < [(2^{2-1})^{1/2}]^2$ **and thus**

$\dfrac{A^m + B^n + 2 * A^{m/2} * B^{n/2}}{C^2} > 1 < 2$ the numerator of the first member of the inequality **is the square of a binomial** of which: $A^m + B^n$ are the two powers, of different degrees, and that are equal to the first member of the equation **1)** and $2 * A^{m/2} * B^{n/2}$ is the product relating to the **binomial.** We delop and obtain the equation **2)**

from which it is clear that

12) - $\dfrac{A^m + B^n}{C^2} = 1$ and $\dfrac{2 * A^{m/2} * B^{n/2}}{C^2} < 1$ **and so we can write**

the equation 1), with integers:

13) - $A^m + B^n = C^2$ furthermore if we replace the two powers A^m and B^n of equation **1)** with exponents equal to **2**, we obtain two equations respectively: $A^2+B^n = C^p$ **e** $A^m+ B^2 =C^p$**,** and carrying out the similar procedure above, we will obtain also the verification of the two equations**,**

therefore we can conclude that:

it is possible to divide a power, with the integer base of degree p, in the sum of two powers respectively of degree m and n, which has the three bases coprime, only if the degree of the power or one of the powers is equal to 2.

Q. E. D.

References

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