

Proof of Beal's Conjecture

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Abstract. We give the complete proof of Beal's conjecture.

Theorem.

If

$$A^x + B^y = C^z$$

where A, B, C, x, y, z are natural numbers and $x, y, z > 2$, then A, B, C have a common prime factor.

Proof.

1. We have the identity:

$$[A(A^x + B^x)]^x + [B(A^x + B^x)]^x = (A^x + B^x)^{x+1} \quad [1],$$

where $A, B, x = 0, 1, 2, 3, \dots$

1.1. If $(A^x + B^x)$ is a prime number with respect to [1]. We find then:

$$2^x = 2^{x+1}$$

$$[2^x \times (2^4 + 1)]^4 + [1 \times (2^4 + 1)]^4 = (2^4 + 1)^5$$

$$(2^4 \times 17^{x+1})^4 + (17^4)^{x+1} = 17^{4x+5}$$

$$(2 \times 97^x)^4 + (3 \times 97^x)^4 = 97^{4x+5}$$

$$(2 \times 641)^4 + (5 \times 641)^4 = 641^5, \text{ Etc.}$$

2, 17, 97, 641 - are common prime factors

2.

$$A^x + B^y = C^z$$

$$1 \times x - 0 \times yz = x$$

$$1 \times y - 0 \times xz = y$$

$$1 \times z - 0 \times xy = z$$

$$(A^1 \times B^{0 \times y} \times C^{0 \times z})^x + (A^{0 \times x} \times B^1 \times C^{0 \times z})^y = (A^{0 \times y} \times B^{0 \times x} \times C^1)^z$$

If $C = P$ - is a prime number, then

$$(A \times P^y)^x + (B \times P^x)^y \equiv P^{xy+z} \quad [2]$$

$$2^2 + 1 = 5, 2^4 + 1 = 17, 2^8 + 1 = 257$$

$$(2 \times 17^{2x})^3 + (3 \times 17^{3x})^2 \equiv 17^{6x+1}$$

$$(2 \times 89^{4x})^3 + (3 \times 89^{3x})^4 \equiv 89^{12x+1}$$

$$(3^{3y})^x + (2 \times 3^{xy})^3 \equiv 3^{3xy+2}$$

3. If the following condition hold $x = ab$, then we obtain from [1]:

$$[A^b(A^{ab} + B^{ab})^b]^a + [B^a(A^{ab} + B^{ab})^a]^b \equiv (A^{ab} + B^{ab})^{ab+1} \quad [3]$$

4. Therefore, the identities [1], [2], [3] with the statement listed in (1), give a comprehensive understanding solvability of equation

$$A_1^x + B_1^y = C_1^z$$

in positive integers.

References:

[1] PROF. DR. K. RAJA RAMA GANDHI, Keuven Tint “ The reproductive solution for Fermat’s Last theorem (elementary aspect)- First proof.

