The Beal Conjecture

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ABSTRACT

BEAL'S CONJECTURE: *If $A^x + B^y = C^z$, where A, B, C, x, y and z are positive integers and x, y and z are all greater than 2, then A, B and C must have a common prime factor.*

SOLUTION*: The Counter Example of the Beal Conjecture is $1^3 + 2^3 = 3^3$ which is proved by two solutions.*

I. INTRODUCTION

This is an Andrew Beal's Theorem. Andrew Beal, a Texas banker and self-taught mathematician offers $ 1 Million to solve his Maths Problem, Beal Conjecture remains unsolved since 1980s.

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THE BEAL PRIZE: The conjecture and prize was announced in the December 1997 issue of the Notices of the American Mathematical Society. Since that time Andy Beal has increased the amount of the prize for his conjecture. The prize is now this: $1,000,000 for either a proof or a counterexample of his conjecture. The Prize money is being held by the American Mathematical Society until it is awarded. In the meantime the interest is being used to fund some AMS activities and the annual Erdos Memorial Lecture.

CONDITIONS FOR WINNING THE PRIZE: The prize will be awarded by the prize committee appointed by the American Mathematical Society. The present committee members are Charles Fefferman, Ron Graham and Dan Mauldin. The requirements for the award are that in the judgment of the committee, the solution has been recognized by the mathematics community. This includes that either a proof has been given and the result has appeared in a reputable refereed journal or a counterexample has been given and verified.

II. SOLUTIONS

The Beal Conjecture:

Theorem: If $A^x + B^y = C^z$ where A, B, C, x, y and z are positive integers and x, y and z are all greater than 2, then A, B, C must have a common prime factor.

Solution:

1. Let $x = y$

$$18x = 18y$$

$$27x - 9x = 27y - 9y$$

$$9y - 9x = 27y - 27x$$

$$9(y - x) = 27(y - x)$$

$$9 = 27$$

Or $1 + 8 = 27$

Or $1^3 + 2^3 = 3^3$

Counter example:	$1^3 + 2^3 = 3^3$

2. The Given Equation is

$$A^x + B^y = C^z \quad \text{--------------(1)}$$

Let $A^x = a$, $B^y = b$ and $C^z = c$

Then equation (1) takes the form

$$a + b = c$$

$$2a - a + 2b - b = c$$

$$2(a + b) - (a + b) = c$$

$$2(a + b) - c = (a + b)$$

On squaring both sides

$$\{2(a + b) - c\}^2 = (a + b)^2 \quad \text{-----------------(2)}$$

If, $a = 1$, $b = 8$ and $c = 27$

Then equation (2) becomes

$$\{2(1 + 8) - 27\}^2 = (1 + 8)^2$$

$$(18 - 27)^2 = (1 + 8)^2$$

$$(-9)^2 = (9)^2$$

$$81 = 81$$

Hence, $A^x = a = 1$ or $A^x = 1^3$

$B^y = b = 8$ or $B^y = 2^3$

and $C^z = c = 27$ or $C^z = 3^3$

On putting these values in equation (1), we get

$$1^3 + 2^3 = 3^3$$

Counter example:	$1^3 + 2^3 = 3^3$

III. CONCLUSION

Therefore it's proved that the counter example of the Beal Conjecture is

$$\boxed{1^3 + 2^3 = 3^3}$$

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