FERMAT'S LAST THEOREM

THEOREM NAME: FERMAT’S LAST THEOREM

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BOOK: ARITHMETICA

FERMAT'S LAST THEOREM

"It is impossible to separate a cube into two cubes, or a biquadrate into two biquadrates, or in general any power higher than the second into two powers of like degree; I have discovered a truly remarkable proof which this margin is too small to contain."

-Pierre de Fermat, (1637)

For whole numbers n greater than 2, there are no numbers a, b, c for which
$a^n + b^n = c^n$

PROOF

$[a^{n/2}]^2 + [b^{n/2}]^2 = [c^{n/2}]^2$

$\{[a/c]^{n/2}\}^2 + \{[b/c]^{n/2}\}^2 = 1$

Let $[a/c]^{n/2} = \sin\theta$

Therefore, $[b/c]^{n/2} = \cos\theta$

Thus, $[a/c]^n = \sin^2\theta$

And $[b/c]^n = \cos^2\theta$

If $n = 1$, $[a/c] = \sin^2\theta$

If $n = 2$, $[a/c]^2 = \sin^2\theta$

If $n = 3$, $[a/c]^3 = \sin^2\theta$

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If $n = n$, $[a/c]^n = \sin^2\theta$ - {Equation 1}

Let $[a/c] = x$, $[b/c] = y$ & $\sin\theta = p$, $\cos\theta = q$

Therefore, Equation 1 implies that $x^n = p^2$ and $y^n = q^2$ for $0<x<1$ & $0<y<1$.

Thus, $x^n + y^n = p^2 + q^2 = 1$ which is not possible.

Hence, n cannot take value greater than 2.

Hence, the proof.