The last theorem of Fermat. Correct proof

In Memory of my MOTHER

The contradiction:

In the equation $A^n=A^n+B^n$ [...=(A+B)R], the number R has two values.

All calculations are done with numbers in base n, a prime number greater than *2*.

Notations:

A', A'', $A_{(t)}$ – the first, the second, the t-th digit from the end of the number *A*;
A_2, A_3, $A_{[t]}$ is the 2-, 3-, t-digit ending of the number *A* (i.e. $A_{[t]} = A \bmod n^t$);
$nn=n*n=n\text{^}2=n^2$.

Definitions:

The "power" ending $A_{[t]}$ of t (t>1) digits is the ending $A'^{n\text{^}\{t-1\}}_{[t]}$ of some natural number $A=A'^{n\text{^}\{t-1\}}+Dn^t$, where A' is the last digit of A.
The "one" ending $r_{[t]}$ is the t-digits ending of a number r, equal to 1.

The FLT is proved for the **base** case (see: http://vixra.org/abs/1707.0410):

L1°) Lemma. The digit $A^n_{(t+1)}$ is determined by the ending $A_{[t]}$ in a unique way (this is a consequence of the Newton binomial). Which means that the endings A^n_2, $A^{n\text{^}2}_3$, and so on do not depend on the digit A'' and are only a function of the digit A'.

L1.1°) Corollary: if $A_{[t+1]}=d^{n\text{^}t}_{[t+1]}$, where $d_2=e^n_2$, then
$A_{[t+2]}=e^{n\text{^}\{t+1\}}_{[t+2]}$ and $A^{n-1}_{[t+2]}=A'^{n-1}_{[t+2]}=1$.

L1.2°) Moreover, $g'^{n-1}_{[t+2]}=1$, where g is any factor of the number A and g' is any factor of the number A'.

L1.3°) If $C_{[t]}=C°_{[t]}$, $A_{[t]}=A°_{[t]}$, $B_{[t]}=B°_{[t]}$ and $C^n_{[t+1]}=A^n_{[t+1]}+B^n_{[t+1]}$, then $C°^n_{[t+1]}=A°^n_{[t+1]}+B°^n_{[t+1]}$ (a consequence of **L1.1°** and Newton's binomial).

L2°) **The lemma**. t-digits ending of any prime factor of the number R in the equality $(A^n+B^n)_{[t+1]}=[(A+B)R]_{[t+1]}$ is equal to 1.

(where $A_{[t]}=A^{n\text{^}\{t-1\}}_{[t]}$, $B_{[t]}=B^{n\text{^}\{t-1\}}_{[t]}$, $(A^{n\text{^}t}+B^{n\text{^}t})_{[t+1]}=C^{n\text{^}t}_{[t+1]}$, t>1, the numbers A and B are co-prime and the number A+B is not divisible by the prime n>2)

This is the consequence of:

a) the equality $(CC^{n-1})_{[t+1]}=[(A+B)R]_{[t+1]}$, where $C_{[t]}=(A+B)_{[t]}=0$, and
b) definition of degree, and
c) L1.2°.

Hypothetical Fermat's equality has three equivalent forms:

1°) $C^n=A^n+B^n$ [...$=(A+B)R=c^nr^n$], $A^n=C^n-B^n$ [...$=(C-B)P=a^np^n$] and $B^n=C^n-A^n$ [...$=(C-A)Q=b^nq^n$], where, for $(ABC)'\neq 0$, the numbers in the pairs (c, r), (a, p), (b, q) are co-prime.

1.1°) The numbers R, P, Q (without a possible factor n) have "one" endings with their shortest length of k digits. If, for example, k=2, then the shortest ending is 01.

1.2°) Therefore, the smallest "one" ending for the numbers r, p, q has k-1 digits.

1.3°) The number $U=A+B-C$ [...$=un^k$] ends with k zeroes, even if A', B' or C'=0.

1.4 °) If, for example, C'= 0 then the number C ends with exactly k zeroes. In that case, its special factor R ends exactly by one zero, which is not included in the number r.

1.5 °) Therefore, in this case the number A+B ends with nk-1 [>k] zeroes.

L3°) <u>Lemma</u>. If the shortest length of a "one" ending of the numbers r, p, q is k-1 (and for the numbers R, P, Q is k), then the k-digits "power" endings of the numbers A and C-B, B and C-A, C and A+B (not multiples of n) are equal to: $A'^{n^{k-1}}$, $B'^{n^{k-1}}$, $C'^{n^{k-1}}$.

<u>Proof of Lemma</u>. Let start with k=2. Then from the equality $A+B-C=un^k$ (1.3°), taking into account 1° and L1°, we find the equalities for the two-digit endings:

$C=c'^n$, $A=a'^n$, $B=b'^n \bmod n^2$, or $C_2=c'^n{}_2$, $A_2=a'^n{}_2$, $B_2=b'^n{}_2$.

Then, if k>2, we substitute these values of the numbers A, B, C in the left parts of the equalities 1°, then we take into account the property L1.1° and solve the system of equations $C^n=A+B$, $A^n=C-B$, $B^n=C-A$, with respect to A, B, C.

And we continue the process until we reach the values $A'^{n^{k-1}}$, $B'^{n^{k-1}}$, $C'^{n^{k-1}}$.

<u>Proof of the FLT</u>

2°) Let the shortest length of the "one" ending among the numbers r, p, q be for the number r and equal to k-1 (in this case $C'\neq 0$). Then the shortest length of the "one" ending for the numbers R, P, Q not multiples of n, will be equal to k. And, consequently, the number $U=A+B-C=un^k$.

Then, according to L3°, in the equalities $C^n=A^n+B^n=(A+B)R=c^nr^n=CC^{n-1}$ (see: 1°) and

3°) $D=(A+B)^n{}_{[k+1]}=[(C-B)^n+(C-A)^n]_{[k+1]}=\{[(C-B)+(C-A)]T\}_{[k+1]}$ k-digit endings of numbers in the pairs C and A+B, A and C-B, B and C-A, C^{n-1} (=1) and $(A+B)^{n-1}$ (=1), R (=1) and T (=1) will be equal and power. According to Lemma L2°, every prime (and composite) factor of T has a "one" ending of at least k digits.
However among the factors of the number T there is also a number r, strictly in the first degree (since the number [(C-B)+(C-A)] is not divisible by r, and the numbers r and D/r are co-prime)!

And we arrived to a contradiction: in the Fermat's equality, the "one" ending of r has a length of strictly k-1 digits, but in the number T it has k digits. Thus, the FLT is proved.

Mézos, December 1, 2017
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