A CLASSIC FORMULA PROVEN BY EUCLID IMPLIES FERMAT'S LAST THEOREM (FLT) FOR INTEGRAL EXPONENT LARGER THAN TWO

FISCHEL A. BLOOM

Abstract. We solve the *open problem* of proving Fermat's Last Theorem (FLT) for $n > 2$ using only tools available to Fermat. We infer from Euclid's formula an n-th power generalization that is equivalent to $z^n - y^n = x^n$. This generalization clearly shows that FLT is correct for integral $\{(z,y,x)\}$with integral n>2.

(1) $$z^n - y^n = x^n.$$

Fermat's last theorem (FLT) states, for (1), with *z,y,x,n* positive integers, $z > y,x$, that (z,y,x) cannot be integral for $n > 2$. We propose a *proof of FLT, using only tools available to Fermat. So, we tackle an open problem.*

We begin with a true statement, Euclid's formula (2), below (with terms rearranged and notation changed). Per the well-known demonstration of rational points on a unit circle, Euclid's formula, holds for the set of all positive (pairwise) coprime (z,y,x) satisfying z^2-y^2=x^2 if and only if *t,s* each is every positive coprime, with $t > s$, and *t,s* of opposite parity. Therefore, Euclid's formula is equivalent to z^2-y^2=x^2 for all "Primitive Pythagorean Triples".

(2) $$(t^2 + s^2)^2 - (t^2 - s^2)^2 = (2ts)^2.$$

For at least one value of $n > 1$ there is a set of all non-null coprime triples for which (2) to (6), below, respectively hold, and for which *t,s* remain solely coprime our entire argument, Equation (2) permits, below, the stepwise deduction that FLT is true.

Since (2) is an identity, we can *substitute* $t^{\frac{n}{2}}$ for *t*, and $s^{\frac{n}{2}}$ for *s* such that equation (2) implies (3), below.

(3) $$(t^{\frac{n}{2}})^2 + (s^{\frac{n}{2}})^2\big)^2 - \big((t^{\frac{n}{2}})^2 - (s^{\frac{n}{2}})^2\big)^2 = (2t^{\frac{n}{2}}s^{\frac{n}{2}})^2$$

Equation (3) reduces to (4), below.

(4) $$(t^n + s^n)^2 - (t^n - s^n)^2 = (2t^{\frac{n}{2}}s^{\frac{n}{2}})^2.$$

Equation (4) implies equation (5) :

(5) $$\left((t^n + s^n)^{\frac{2}{n}}\right)^n - \left((t^n - s^n)^{\frac{2}{n}}\right)^n = \left((2t^{\frac{n}{2}} s^{\frac{n}{2}})^{\frac{2}{n}}\right)^n$$

Equation (5) simplifies to equation (6), our nth generalization of (2).

(6) $$\left((t^n + s^n)^{\frac{2}{n}}\right)^n - \left((t^n - s^n)^{\frac{2}{n}}\right)^n = (2^{\frac{2}{n}} ts)^n.$$

This is the key point : For $n > 2$ there is no coprime Fermat triple that satisfies (6) since $2^{\frac{2}{n}} ts$ cannot be integral.

By definition, equation (6) is equivalent to $z^n - y^n = x^{n,}$. So, for $n > 2$, there is a null set of all coprime (z,y,x) satisfying $z^n - y^n = x^n$

Thus, the set of all integral (z,y,x) satisfying $z^n - y^n = x^n$ is null for n>2.

Q.E.D.

Email address: brainemail1@charter.net