

An Elementary Procedure in the Proof of Fermat's Last Theorem

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Abstract. Pierre de Fermat first stated, around 1637, that for any integer $n > 2$, the equation $an + bn = cn$ has no positive integer solutions, and he wrote the theorem in the margin of a copy of *Arithmetica*. His proof is available only for the equation $a^4 + b^4 = c^4$ for the exponent $n = 4$. Subsequently, Euler proved the theorem in the equation $a^3 + b^3 = c^3$ for the exponent $n = 3$. Taking the above two proofs of Fermat and Euler, it would suffice to prove the theorem for $n = p$, where p is any prime > 3 . In this proof, we hypothesize all r, s and t as positive integers satisfying the equation $rp + sp = tp$ and establish a contradiction. We use another auxiliary equation, $x^3 + y^3 = z^3$, and combine the two equations using transformation equations. Solving the transformation equations, we establish a contradiction, thereby proving the theorem.

Keywords: Transformation Equations.

Mathematics Subject Classification: 2010: 11A-XX.

I. INTRODUCTION

Pierre-de-Fermat, a French mathematician around 1637, wrote in the margin of a copy of *Arithmetica* that it is impossible to find positive integers A, B and C satisfying the equation $A^n + B^n = C^n$, where n is an integer greater than 2. He stated that he himself had found a marvelous proof for the equation but the margin was too narrow to contain it. His proof for the theorem is available only for $n = 4$, using the infinite descent method. Subsequently, Euler proved the theorem for $n = 3$ [1].

Dirichlet, Legendre, and Lamé proved the theorem for the exponents $n = 5$ and $n = 7$. Around 1820, Sophie Germain proved the theorem for some specific cases. Kummer proved the theorem for regular primes. He invented ideal number theory, and number theory has developed leaps and bounds into newer areas. Mathematicians observed a close connection between Fermat's Last Theorem and Elliptic Curves [2]. After 358 years, in 1995, Prof. Andrew Wiles proved the theorem completely [3]. Many mathematicians and number theorists have contributed to and analysed the theorem [4]. In this proof, we are trying for an alternative elementary proof of Fermat's Last Theorem.

II. ASSUMPTIONS

- We hypothesize that r, s and t are positive integers satisfying the equation $r^p + s^p = t^p$. Here, p is any prime > 3 . Clearly, $\gcd(r, s, t) = 1$, and we establish a centre contradiction in this proof. Any two of the variables r, s and t cannot simultaneously be squares.
- We include the auxiliary equation $x^3 + y^3 = z^3$ in this proof, in which we can have both x and y to be positive integers; z^3 will be a positive integer; both z and z^2 irrational. As $\gcd(xy, z^3) = 1$, $\sqrt{xy}$ will be foolish, since both x and y cannot simultaneously be squares.
- We have defined F, R as positive odd primes each coprime to each x, y, z^3, r, s , & t and $E = (xyz^3rt)^3$.
- We can have r, s and t some other odd prime factors coprime to x, y and z^3 .

Proof. By random experiment, we have created the following equations.

$$\left(a\sqrt{z^3} + b\sqrt{F^{1/3}}\right)^2 + \left(c\sqrt{E^{1/3}} + d\sqrt{R^{1/3}}\right)^2 = \left(e\sqrt{xr} + f\sqrt{E^{5/3}}\right)^2$$

and

$$\left(a\sqrt{t^p} - b\sqrt{ys}\right)^2 + \left(c\sqrt{r^p} - d\sqrt{t}\right)^2 = \left(e\sqrt{F^{5/3}} - f\sqrt{s^p}\right)^2 \quad (1)$$

as the transformation equations of $x^3 + y^3 = z^3$ and $r^p + s^p = t^p$ respectively, through the parameters called a, b, c, d, e and f . Here, F and R are distinct odd primes, each coprime to x, y, z^3, r, s , and t , and $E = (xyz^3rt)^3$.

From equation (1), we get

$$a\sqrt{z^3} + b\sqrt{F^{1/3}} = \sqrt{x^3} \quad (2)$$

$$a\sqrt{t^p} - b\sqrt{ys} = \sqrt{r^p} \quad (3)$$

$$c\sqrt{E^{1/3}} + d\sqrt{R^{1/3}} = \sqrt{y^3} \quad (4)$$

$$c\sqrt{r^p} - d\sqrt{t} = \sqrt{s^p} \quad (5)$$

$$e\sqrt{xr} + f\sqrt{E^{5/3}} = \sqrt{z^3} \quad (6)$$

and

$$e\sqrt{F^{5/3}} - f\sqrt{s^p} = \sqrt{t^p} \quad (7)$$

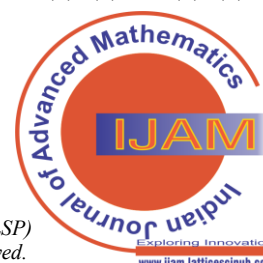
Solving simultaneously (2) and (3), (4) and (5), (6) and (7), we get

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$$a = \left(\sqrt{x^3 y s} + \sqrt{F^{1/3} r^p} \right) / \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} t^p} \right)$$

$$d = \left(\sqrt{y^3 r^p} - \sqrt{E^{1/3} s^p} \right) / \left(\sqrt{E^{1/3} t} + \sqrt{R^{1/3} r^p} \right)$$

$$b = \left(\sqrt{x^3 t^p} - \sqrt{r^p z^3} \right) / \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} t^p} \right)$$

$$e = \left(\sqrt{z^3 s^p} + \sqrt{E^{5/3} t^p} \right) / \left(\sqrt{x r s^p} + \sqrt{(FE)^{5/3}} \right)$$

$$c = \left(\sqrt{y^3 t} + \sqrt{R^{1/3} s^p} \right) / \left(\sqrt{E^{1/3} t} + \sqrt{R^{1/3} r^p} \right)$$

And

$$f = \left(\sqrt{F^{5/3} z^3} - \sqrt{x r t^p} \right) / \left(\sqrt{x r s^p} + \sqrt{(FE)^{5/3}} \right)$$

From (3) & (7), we get

$$\sqrt{t^p} \times \sqrt{t^p} = \left(\sqrt{r^p} + b\sqrt{y s} \right) \left(e\sqrt{F^{5/3}} - f\sqrt{s^p} \right) / (a)$$

$$\text{i.e., } t^p = \left\{ (e)\sqrt{F^{5/3} r^p} - (f)\sqrt{r^p s^p} + (be)\sqrt{F^{5/3} y s} - (bf)\sqrt{y s^{p+1}} \right\} / (a)$$

From (3) & (5), we have

$$\sqrt{r^p} \times \sqrt{r^p} = \left(a\sqrt{t^p} - b\sqrt{y s} \right) \left(\sqrt{s^p} + d\sqrt{t} \right) / (c)$$

$$\text{i.e., } r^p = \left\{ (a)\sqrt{s^p t^p} + (ad)\sqrt{t^{p+1}} - (b)\sqrt{y s^{p+1}} - (bd)\sqrt{y s t} \right\} / (c)$$

From (5) & (7), we get

$$\sqrt{s^p} \times \sqrt{s^p} = \left(c\sqrt{r^p} - d\sqrt{t} \right) \left(e\sqrt{F^{5/3}} - \sqrt{t^p} \right) / (f)$$

$$\text{i.e., } s^p = \left\{ (ce)\sqrt{F^{5/3} r^p} - (c)\sqrt{r^p t^p} - (de)\sqrt{F^{5/3} t} + (d)\sqrt{t^{p+1}} \right\} / (f)$$

Substituting the above equivalent values of t^p , r^p and s^p in the Fermat's equation $r^p + s^p = t^p$ after multiplying both sides by $\{acf\}$, we get

$$\begin{aligned} & \{cf\} \left\{ (e)\sqrt{F^{5/3} r^p} - (f)\sqrt{r^p s^p} + (be)\sqrt{F^{5/3} y s} - (bf)\sqrt{y s^{p+1}} \right\} \\ &= (af) \left\{ (a)\sqrt{s^p t^p} + (ad)\sqrt{t^{p+1}} - (b)\sqrt{y s^{p+1}} - (bd)\sqrt{y s t} \right\} \\ &+ (ac) \left\{ (ce)\sqrt{F^{5/3} r^p} - (c)\sqrt{r^p t^p} - (de)\sqrt{F^{5/3} t} + (d)\sqrt{t^{p+1}} \right\} \quad (8) \end{aligned}$$

Our aim is to compute all rational terms in equation (8) after multiplying both sides by

$$\left\{ \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} t^p} \right)^2 \left(\sqrt{E^{1/3} t} + \sqrt{R^{1/3} r^p} \right)^2 \left(\sqrt{x r s^p} + \sqrt{(FE)^{5/3}} \right)^2 \right\}$$

for freeing from denominators on the parameters a, b, c, d, e and f and again multiplying both sides by $\sqrt{x z^3 s t}$ for getting some rational terms.

I term in LHS of equation (8), after multiplying by the respective terms and substituting for $\{c(ef)\}$

$$\begin{aligned} &= \sqrt{F^{5/3} r^p} \left\{ (y z^3 s) + (F^{1/3} t^p) + 2\sqrt{F^{1/3} y z^3 s t^p} \right\} \left(\sqrt{E^{1/3} t} + \sqrt{R^{1/3} r^p} \right) \\ &\times \sqrt{x z^3 s t} \left(\sqrt{y^3 t} + \sqrt{R^{1/3} s^p} \right) \left(\sqrt{z^3 s^p} + \sqrt{E^{5/3} t^p} \right) \left(\sqrt{F^{5/3} z^3} - \sqrt{x r t^p} \right) \end{aligned}$$

(i) On multiplying by

$$\left\{ \sqrt{F^{5/3} r^p} \left(2\sqrt{F^{1/3} y z^3 s t^p} \right) \sqrt{E^{1/3} t} \sqrt{x z^3 s t} \sqrt{y^3 t} \sqrt{E^{5/3} t^p} \left(-\sqrt{x r t^p} \right) \right\}$$

We get

$$\left\{ - \left(2FE x y^2 z^3 s t^{p+1} \right) \sqrt{(rt)^{p+1}} \right\}$$

(ii) Also, on multiplying by

$$\left\{ \sqrt{F^{5/3} r^p} \left(F^{1/3} t^p \right) \sqrt{E^{1/3} t} \sqrt{x z^3 s t} \sqrt{y^3 t} \sqrt{z^3 s^p} \sqrt{F^{5/3} z^3} \right\}$$

We get

$$\left\{ \left(F^2 z^3 t^{p+1} \right) \sqrt{s^{p+1}} \sqrt{E^{1/3} x y^3 z^3 r^p t} \right\}$$

Which is rational.

II term in LHS of equation (8), after multiplying by the respective terms and substituting for $\{cf^2\}$

$$\begin{aligned} &= \left(-\sqrt{r^p s^p} \right) \left\{ \left(yz^3 s \right) + \left(F^{1/3} t^p \right) + \left(2\sqrt{F^{1/3} y z^3 s t^p} \right) \right\} \left(\sqrt{E^{1/3} t} + \sqrt{R^{1/3} r^p} \right) \sqrt{x z^3 s t} \\ &\quad \times \left(\sqrt{y^3 t} + \sqrt{R^{1/3} s^p} \right) \left\{ \left(F^{5/3} z^3 \right) + \left(x r t^p \right) - 2\sqrt{F^{5/3} x z^3 r t^p} \right\} \end{aligned}$$

On multiplying by

$$\left\{ \left(-\sqrt{r^p s^p} \right) \left\{ \left(x y z^3 r s t^p \right) + \left(F^2 t^p z^3 \right) \right\} \sqrt{E^{1/3} t} \sqrt{x z^3 s t} \sqrt{y^3 t} \right\}$$

We get

$$\left\{ - \left(t \sqrt{s^{p+1}} \right) \sqrt{E^{1/3} x y^3 z^3 r^p t} \left[\left(x y z^3 r s t^p \right) + \left(F^2 t^p z^3 \right) \right] \right\}$$

Which will be rational since we have defined $E^{1/3} = (xyz^3rt)$.

III term in LHS of equation (8), after multiplying by the respective terms and substituting for $\{bc(ef)\}$

$$\begin{aligned} &= \sqrt{F^{5/3} y s} \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} t^p} \right) \left(\sqrt{E^{1/3} t} + \sqrt{R^{1/3} r^p} \right) \sqrt{x z^3 s t} \left(\sqrt{x^3 t^p} - \sqrt{r^p z^3} \right) \\ &\quad \times \left(\sqrt{y^3 t} + \sqrt{R^{1/3} s^p} \right) \left(\sqrt{z^3 s^p} + \sqrt{E^{5/3} t^p} \right) \left(\sqrt{F^{5/3} z^3} - \sqrt{x r t^p} \right) \end{aligned}$$

On multiplying by

$$\left\{ \sqrt{F^{5/3} y s} \sqrt{F^{1/3} t^p} \sqrt{E^{1/3} t} \sqrt{x z^3 s t} \left(-\sqrt{r^p z^3} \right) \sqrt{y^3 t} \sqrt{E^{5/3} t^p} \left(-\sqrt{x r t^p} \right) \right\}$$

We get

$$\left\{ \left(F E x y^2 z^3 s t^{p+1} \right) \sqrt{(rt)^{p+1}} \right\}$$

IV term in LHS of equation (8), after multiplying by the respective terms and substituting for $\{bcf^2\}$

$$\begin{aligned} &= \left(-\sqrt{y s^{p+1}} \right) \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} t^p} \right) \left(\sqrt{E^{1/3} t} + \sqrt{R^{1/3} r^p} \right) \sqrt{x z^3 s t} \\ &\quad \times \left(\sqrt{x^3 t^p} - \sqrt{r^p z^3} \right) \left(\sqrt{y^3 t} + \sqrt{R^{1/3} s^p} \right) \left\{ \left(F^{5/3} z^3 \right) + \left(x r t^p \right) - 2\sqrt{F^{5/3} x z^3 r t^p} \right\} \end{aligned}$$

On multiplying by

$$\left\{ \left(-\sqrt{y s^{p+1}} \right) \sqrt{y z^3 s} \sqrt{E^{1/3} t} \sqrt{x z^3 s t} \sqrt{x^3 t^p} \sqrt{y^3 t} \left(x r t^p \right) \right\}$$

We get

$$\left\{ - \left(x^3 y^2 z^3 r s t^{p+1} \right) \sqrt{(st)^{p+1}} \sqrt{E^{1/3} y} \right\}$$

Which will be irrational since we have defined $E^{1/3} = (xyz^3rt)$.

I term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{a^2f\}$

$$\begin{aligned} &= \sqrt{s^p t^p} \left\{ \left(E^{1/3} t \right) + \left(R^{1/3} r^p \right) + 2\sqrt{E^{1/3} R^{1/3} r^p t} \right\} \sqrt{x z^3 s t} \\ &\quad \times \left(\sqrt{x r s^p} + \sqrt{(FE)^{5/3}} \right) \left\{ \left(x^3 y s \right) + \left(F^{1/3} r^p \right) + 2\sqrt{F^{1/3} x^3 y r^p s} \right\} \left(\sqrt{F^{5/3} z^3} - \sqrt{x r t^p} \right) \end{aligned}$$

On multiplying by

$$\sqrt{s^p t^p} \left(E^{1/3} t \right) \sqrt{x r s^p} \sqrt{x z^3 s t} \left(2\sqrt{F^{1/3} x^3 y r^p s} \right) \sqrt{F^{5/3} z^3}$$

we get

$$\left\{ \left(2 F E^{1/3} x^2 z^3 s^{p+1} t \right) \sqrt{(rt)^{p+1}} \sqrt{xy} \right\}$$

Which is irrational.

II term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{(a^2df)\}$

$$= \sqrt{t^{p+1}} \left(\sqrt{E^{1/3}t} + \sqrt{R^{1/3}r^p} \right) \left(\sqrt{xrs^p} + \sqrt{(FE)^{5/3}} \right) \sqrt{xz^3st} \\ \times \left\{ (x^3ys) + (F^{1/3}r^p) + 2\sqrt{F^{1/3}x^3yr^ps} \right\} \left(\sqrt{y^3r^p} - \sqrt{E^{1/3}s^p} \right) \left(\sqrt{F^{5/3}z^3} - \sqrt{xrt^p} \right)$$

(i) On multiplying by

$$\left\{ \sqrt{t^{p+1}} \sqrt{E^{1/3}t} \sqrt{(FE)^{5/3}} \sqrt{xz^3st} (F^{1/3}r^p) \sqrt{y^3r^p} \sqrt{F^{5/3}z^3} \right\}$$

we get

$$\left\{ (F^2Er^pz^3t) \sqrt{t^{p+1}} \sqrt{xy^3r^ps} \right\}$$

(ii) Also, on multiplying by

$$\left\{ \sqrt{t^{p+1}} \sqrt{E^{1/3}t} \sqrt{xrs^p} \sqrt{xz^3st} \left(2\sqrt{F^{1/3}x^3yr^ps} \right) \left(-\sqrt{E^{1/3}s^p} \right) \sqrt{F^{5/3}z^3} \right\}$$

we get

$$\left\{ -\left(2FE^{1/3}x^2z^3s^{p+1}t \right) \sqrt{(rt)^{p+1}} \sqrt{xy} \right\}$$

Which will be irrational, since both x and y cannot simultaneously be squares, since $\gcd(x, y) = 1$ in the equation $x^3 + y^3 = z^3$.

III term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{(ab)f\}$

$$= \left(-\sqrt{ys^{p+1}} \right) \left(\sqrt{xrs^p} + \sqrt{(FE)^{5/3}} \right) \left\{ (E^{1/3}t) + (R^{1/3}r^p) + 2\sqrt{E^{1/3}R^{1/3}r} \right\} \sqrt{xz^3st} \\ \times \left(\sqrt{x^3ys} + \sqrt{F^{1/3}r^p} \right) \left(\sqrt{x^3t^p} - \sqrt{r^pz^3} \right) \left(\sqrt{F^{5/3}z^3} - \sqrt{xrt^p} \right)$$

On multiplying by

$$\left\{ \left(-\sqrt{ys^{p+1}} \right) \sqrt{xrs^p} (E^{1/3}t) \sqrt{xz^3st} \sqrt{F^{1/3}r^p} \sqrt{x^3t^p} \sqrt{F^{5/3}z^3} \right\}$$

we get

$$\left\{ (FE^{1/3}x^2z^3s^{p+1}t) \sqrt{(rt)^{p+1}} \sqrt{xy} \right\}$$

Which is irrational.

IV term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{(ab)df\}$

$$= \left(-\sqrt{yst} \right) \left(\sqrt{E^{1/3}t} + \sqrt{R^{1/3}r^p} \right) \left(\sqrt{xrs^p} + \sqrt{(FE)^{5/3}} \right) \sqrt{xz^3st} \\ \times \left(\sqrt{x^3ys} + \sqrt{F^{1/3}r^p} \right) \left(\sqrt{x^3t^p} - \sqrt{r^pz^3} \right) \left(\sqrt{y^3r^p} - \sqrt{E^{1/3}s^p} \right) \left(\sqrt{F^{5/3}z^3} - \sqrt{xrt^p} \right)$$

(i) On multiplying by

$$\left\{ \left(-\sqrt{yst} \right) \sqrt{E^{1/3}t} \sqrt{(FE)^{5/3}} \sqrt{xz^3st} \sqrt{F^{1/3}r^p} \left(-\sqrt{r^pz^3} \right) \sqrt{y^3r^p} \left(-\sqrt{xrt^p} \right) \right\}$$

we get

$$\left\{ -\left(FExy^2z^3r^pst \right) \sqrt{(rt)^{p+1}} \right\}$$

(ii) Also, on multiplying by

$$\left\{ \left(-\sqrt{yst} \right) \sqrt{E^{1/3}t} \sqrt{xrs^p} \sqrt{xz^3st} \sqrt{x^3ys} \left(-\sqrt{r^pz^3} \right) \sqrt{y^3r^p} \left(-\sqrt{xrt^p} \right) \right\}$$

we get

$$\left\{ (x^3y^2z^3r^{p+1}st) \sqrt{(st)^{p+1}} \sqrt{E^{1/3}y} \right\}$$

Which is irrational.

V term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{ac^2e\}$

$$= \sqrt{F^{5/3}r^p} \left(\sqrt{yz^3s} + \sqrt{F^{1/3}t^p} \right) \left(\sqrt{xrs^p} + \sqrt{(FE)^{5/3}} \right) \sqrt{xz^3st}$$

$$\times \left(\sqrt{x^3 y s} + \sqrt{F^{1/3} r^p} \right) \left\{ \left(y^3 t \right) + \left(R^{1/3} s^p \right) + 2\sqrt{R^{1/3} y^3 s^p t} \right\} \left(\sqrt{z^3 s^p} + \sqrt{E^{5/3} t^p} \right)$$

On multiplying by

$$\left\{ \sqrt{F^{5/3} r^p} \sqrt{F^{1/3} t^p} \sqrt{x r s^p} \sqrt{x z^3 s t} \sqrt{x^3 y s} \left(y^3 t \right) \sqrt{z^3 s^p} \right\}$$

we get

$$\left\{ \left(F x^2 y^3 z^3 s^{p+1} t \right) \sqrt{(r t)^{p+1}} \sqrt{x y} \right\}$$

Which is irrational.

VI term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{ac^2\}$

$$= \left(-\sqrt{r^p t^p} \right) \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} r^p} \right) \left\{ \left(x r s^p \right) + \left(F E \right)^{5/3} + 2\sqrt{\left(F E \right)^{5/3} x r s^p} \right\} \sqrt{x z^3 s t} \\ \times \left(\sqrt{x^3 y s} - \sqrt{F^{1/3} r^p} \right) \left\{ \left(y^3 t \right) + \left(R^{1/3} s^p \right) + 2\sqrt{R^{1/3} y^3 s^p t} \right\}$$

On multiplying by

$$\left\{ \left(-\sqrt{r^p t^p} \right) \sqrt{y z^3 s} \left(x r s^p \right) \sqrt{x z^3 s t} \sqrt{x^3 y s} \left(y^3 t \right) \right\}$$

we get

$$\left\{ - \left(x^3 y^4 z^3 r s^{p+1} \right) \sqrt{t^{p+1}} \sqrt{r^p s} \right\}$$

Which will be irrational, since both r & s cannot simultaneously be squares.

VII term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{a(cd)e\}$

$$= \left(-\sqrt{F^{5/3} t} \right) \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} t^p} \right) \left(\sqrt{x r s^p} + \sqrt{\left(F E \right)^{5/3}} \right) \sqrt{x z^3 s t} \\ \times \left(\sqrt{x^3 y s} + \sqrt{F^{1/3} r^p} \right) \left(\sqrt{y^3 t} + \sqrt{R^{1/3} s^p} \right) \left(\sqrt{y^3 r^p} - \sqrt{E^{1/3} s^p} \right) \left(\sqrt{z^3 s^p} + \sqrt{E^{5/3} t^p} \right)$$

On multiplying by

$$\left\{ \left(-\sqrt{F^{5/3} t} \right) \sqrt{y z^3 s} \sqrt{x r s^p} \sqrt{x z^3 s t} \sqrt{F^{1/3} r^p} \sqrt{y^3 t} \left(-\sqrt{E^{1/3} s^p} \right) \sqrt{E^{5/3} t^p} \right\}$$

we get

$$\left\{ \left(F E x y^2 z^3 s^{p+1} t \right) \sqrt{(r t)^{p+1}} \right\}$$

Which is rational.

VIII term in RHS of equation (8), after multiplying by the respective terms and substituting for $\{a(cd)\}$

$$= \sqrt{t^{p+1}} \left(\sqrt{y z^3 s} + \sqrt{F^{1/3} t^p} \right) \left\{ \left(x r s^p \right) + \left(F E \right)^{5/3} + 2\sqrt{\left(F E \right)^{5/3} x r s^p} \right\} \sqrt{x z^3 s t} \\ \times \left(\sqrt{x^3 y s} + \sqrt{F^{1/3} r^p} \right) \left(\sqrt{y^3 t} + \sqrt{R^{1/3} s^p} \right) \left(\sqrt{y^3 r^p} - \sqrt{E^{1/3} s^p} \right)$$

(i) On multiplying by

$$\left\{ \sqrt{t^{p+1}} \sqrt{y z^3 s} \left(x r s^p \right) \sqrt{x z^3 s t} \sqrt{x^3 y s} \sqrt{y^3 t} \left(-\sqrt{E^{1/3} s^p} \right) \right\}$$

we get

$$\left\{ - \left(x^3 y^2 z^3 r s^{p+1} t \right) \sqrt{(s t)^{p+1}} \sqrt{E^{1/3} y} \right\}$$

Which will be irrational, since we have defined $E^{1/3} = (xyz^3 rt)$.

(ii) Also, on multiplying by

$$\left\{ \sqrt{t^{p+1}} \sqrt{y z^3 s} \left(2\sqrt{\left(F E \right)^{5/3} x r s^p} \right) \sqrt{x z^3 s t} \sqrt{F^{1/3} r^p} \sqrt{y^3 t} \left(-\sqrt{E^{1/3} s^p} \right) \right\}$$

we get

$$\left\{ - \left(2 F E x y^2 z^3 s^{p+1} t \right) \sqrt{(r t)^{p+1}} \right\} = \left\{ - \left(x y z^3 r s t^{p+1} \right) \sqrt{s^{p+1}} \sqrt{E^{1/3} x y z^3 r^p t} \right\}$$

(combining I & II terms)

Which will be rational.

Sum of all rational terms in the LHS of equation (8)

$$-\left\{\left(FExy^2z^3st^{p+1}\right)\sqrt{(rt)^{p+1}}\right\}$$

(combining I & III terms)

Sum of all rational terms in the RHS of equation (8)

$$=\left\{-\left(FExy^2z^3r^pst\right)\sqrt{(rt)^{p+1}}\right\}$$

(vide IV term)

$$+\left\{\left(FExy^2z^3s^{p+1}t\right)\sqrt{(rt)^{p+1}}\right\} \quad (\text{vide VII term})$$

$$-\left\{\left(2FExy^2z^3s^{p+1}t\right)\sqrt{(rt)^{p+1}}\right\}$$

$$=-\left(FExy^2z^3st\right)\sqrt{(rt)^{p+1}} \left(r^p + s^p\right)$$

$$=-\left(FExy^2z^3st^{p+1}\right)\sqrt{(rt)^{p+1}} \quad (\because r^p + s^p = t^p)$$

Equating the rational term on both sides, we get

$$-\left(xyz^3\right)\left(rst^{p+1}\right)\sqrt{s^{p+1}}\sqrt{E^{1/3}xyz^3r^pt}=0$$

Dividing both sides by

$$-\left(xyz^3\right) \text{ and substituting for } E^{1/3} = xyz^3rt$$

We get

$$\left\{\left(rst^{p+1}\right)\sqrt{s^{p+1}}\left(xyz^3t\right)\sqrt{r^{p+1}}\right\}=0$$

That is, either $r=0$ or $s=0$ or $t=0$.

This contradicts our hypothesis that all r, s and t are non-zero integers in the Fermat equation $rp + sp = tp$, which proves that only a trivial solution exists.

III. CONCLUSIONS

Equation (8) was derived from the two transformation equations by substituting the equivalent values of rp, sp & tp in Fermat's equation $rp + sp = tp$. The central hypothesis we made in the proof, namely that r, s , and t are non-zero integers, has been shattered by the result $rst = 0$; thus, we are proving the theorem.

DECLARATION STATEMENT

Some of the references cited are older, noted explicitly as [1], [2], [3] and [4]. However, these works remain significant for the current study, as they are pioneering in their fields.

I must verify the accuracy of the following information as the article's author.

- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures that the research is conducted with objectivity and without any external influence.

- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate with supporting documentation.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Author's Contributions:** The authorship of this article is contributed solely.

REFERENCES

1. Hardy G. H. and Wright E. M., *An introduction to the theory of numbers*, 6th ed. Oxford University Press, 2008, pp. 261-586. DOI: <https://dx.doi.org/10.1080/00107510903084414>, works remain significant, see [declaration](#)
2. Lawrence C. Washington, *Elliptic Curves, Number Theory and Cryptography*, 2nd ed. 2003, pp. 445-448. DOI: <https://doi.org/10.1201/9781420071474>, works remain significant, see [declaration](#)
3. Andrew Wiles, *Modular Elliptic Curves and Fermat's Last Theorem*, *Annals of Mathematics*, 1995; 141(3); pp.443-551. DOI: <https://doi.org/10.2307/2118559>, works remain significant, see [declaration](#)
4. 13 Lectures on *Fermat's Last Theorem* by Paulo Ribenboim, Publisher: Springer, New York, initially published in 1979, page 159. DOI: <https://doi.org/10.1007/978-1-4684-9342-9>, works remain significant, see [declaration](#)

SUPPLEMENTARY DATA

In the II term in the RHS of equation (8)

(iii) Again on multiplying by

$$\left\{\sqrt{t^{p+1}}\sqrt{E^{1/3}t}\sqrt{xrs^p}\sqrt{xz^3st}\left(x^3ys\right)\sqrt{y^3r^p}\left(-\sqrt{xrt^p}\right)\right\}$$

We get the rational term.

$$\left\{-\left(x^4y^2rst^{p+1}\right)\sqrt{s^{p+1}}\sqrt{E^{1/3}xyz^3r^pt}\right\}$$

This algebraically cancels with the rational term worked out below under the IV term in the RHS of equation (8).

In the IV term in the RHS of equation (8)

(iii) Again on multiplying by

$$\left\{\left(-\sqrt{yst}\right)\sqrt{E^{1/3}t}\sqrt{xrs^p}\sqrt{xz^3st}\sqrt{x^3ys}\sqrt{x^3t^p}\sqrt{y^3r^p}\left(-\sqrt{xrt^p}\right)\right\}$$

We get

$$\left\{\left(x^4y^2rst^{p+1}\right)\sqrt{s^{p+1}}\sqrt{E^{1/3}xyz^3r^pt}\right\}$$

In the VII term in the RHS of equation (8)

(ii) On multiplying by

$$\left\{\left(-\sqrt{F^{5/3}t}\right)\sqrt{F^{1/3}t^p}\sqrt{(FE)^{5/3}}\sqrt{xz^3st}\sqrt{F^{1/3}r^p}\sqrt{y^3t}\left(-\sqrt{E^{1/3}s^p}\right)\sqrt{E^{5/3}t^p}\right\}$$

we get the rational term

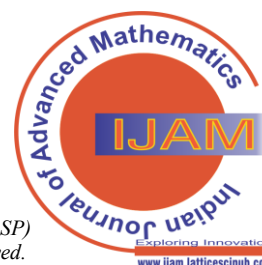
$$\left\{\left(F^2E^{5/3}t^{p+1}\right)\sqrt{s^{p+1}}\sqrt{E^{1/3}xy^3z^3r^pt}\right\}$$

$$[\because E=(xyz^3rt)^3]$$

This term gets cancelled algebraically with the rational term worked out under the VIII term

in the RHS below.

In the VIII term in the RHS of equation (8)



(iii) Again on multiplying by

$$\left\{ \sqrt{t^{p+1}} \sqrt{F^{1/3} t^p} (FE)^{5/3} \sqrt{xz^3 st} \sqrt{F^{1/3} r^p} \sqrt{y^3 t} \left(-\sqrt{E^{1/3} s^p} \right) \right\}$$

We get the rational term.

$$\left\{ -\left(F^2 E^{5/3} t^{p+1} \right) \sqrt{s^{p+1}} \sqrt{E^{1/3} xy^3 z^3 r^p t} \right\}$$

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